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ABSTRACT

The purpose of this study was to compare graduates of the Undergraduate and Post-Degree Programs in secondary school science at the Ohio State University, with respect to their attitudes toward the use of inquiry activities, use of inquiry activities in the classroom and the use of effective classroom management practices. Teacher characteristics and contextual variables which were related to these attitudes and practices were also identified. The sample consisted of 51 graduates teaching full-time in the United States who received teacher certification within five years of the study. Results indicated significant differences between the undergraduate and post-degree graduates with respect to their attitudes toward inquiry. Post-Degree Program graduates held more positive attitudes toward inquiry-oriented laboratory preparation. No significant differences were found between the two groups in their use of inquiry or effective management practices. Teachers rated high in their use of inquiry were more likely to be perceived by students as having positive student-teacher relationships and using effective management practices. In addition, these teachers felt they had no discipline problems and worked with administrators who provided sufficient support for discipline and instruction. Extensive appendices include program descriptions, study instruments and questionnaires, a table showing means, standard deviations, and number of cases for all variables, and a correlation matrix for all variables. (ML)

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COMPARISON OF SELECTED INSTRUCTIONAL AND CLASSROOM MANAGEMENT PRACTICES OF GRADUATES FROM TWO SCIENCE TEACHER EDUCATION PROGRAMS

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

Melissa Moorhead Conrath, B.A., M.S.

* * * * *

The Ohio State University

1986

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CHAPTER I

INTRODUCTION AND OVERVIEW

The focus in American schools within the last decade has most assuredly been on excellence. Although there is diversity in views as to what constitutes "excellence" and how it can be achieved, there is unanimity in the belief that we must strengthen our programs in science education. This comes at a time when science and technology are playing an increasingly important role in our society. In order to meet the demands of a science and technology based society, The National Science Teachers' Association states that the goal of science education in the 1980's is to develop scientific and technological literacy among all citizens (NSTA, 1982). The recent report Educating Americans for the 21st Century (1983) documents the need for improving science education and sets forth a plan of action to achieve scientific and technological literacy. An increase in opportunities for students to experience the nature of scientific inquiry was among the recommendations included in this plan.

Inquiry learning has long been a goal of science education. It was the primary goal of the curriculum development efforts in the 1950's and 1960's. Despite the broadening of this goal in the 1970's to include the application and social impact of science, inquiry continues to be a desired outcome (Anderson, 1983).

Another recommendation set forth to improve science education is an increase in the amount of time spent on science learning. One means of achieving this is through more efficient use of currently alloted time for science. Engaged time is that portion of allocated time that students are actively attending to instruction. If that portion could be increased, and research has identified specific teacher behaviors which accomplish this, more high quality instruction would result with no increase in allocated time (Fisher et. al., 1980).

Competent science teachers are essential in order to achieve excellence in science education. Every day they must make decisions concerning the instructional activities to be used in the classroom. These decisions have a direct impact on the learning outcomes for the students. In order to obtain the desired outcomes science teachers must be able to select and implement appropriate instructional practices.

Tied to the instructional role that teachers perform in the classroom is their role in classroom management. Regardless of specific instructional objectives, teachers need to be effective managers in order to be effective in their instructional role. Classroom management implies more than discipline. It involves the planning and organizing of students, space, time, and materials so that instruction in content and learning activities can take place (Anderson et. al., 1980). Recent research has shown that classroom management practices have an impact upon student outcomes.

Investigators have identified classroom management practices used in a variety of grade levels and subjects that are associated with increased student engagement as well as with increased student achievement (Emmer, 1981; Evertson and Emmer, 1982; Kounin, 1970). Several other investigators have identified management practices used in junior high and high school science classrooms which are related to desired student outcomes (Beasley, 1983; McGarity and Butts, 1984; Sanford, 1984; and Tobin, 1984). Student outcomes can, in turn, impact upon teachers' decisions concerning instruction. The classrooms of teachers with poor management skills are typically chaotic and disorganized. Sanford (1984) suggested that teachers who experience difficulty in getting students to cooperate and activities to flow smoothly are more likely to restrict classroom activities to seatwork. Doyle (1979) relates this specifically to inquiry activities. He suggests that inquiry laboratory activities are more difficult than seatwork for securing cooperation from a large number of students.

> Activity structures that involve multiple signals and complex interdependencies among students are likely to be difficult to implement unless a teacher is especially skilled in managing behavior task initiation. Similarily, gaining cooperation in activities with certain tasks that only a few students can accomplish or that place special demands on students' information processing will probably require extra teacher effort and skill. Thus implementing a science activity in which 30 sixth graders in groups of six are to discover the principles of acceleration by rotating through five learning stations would test the management abilities of the most seasoned teacher. (p. 56).

This line of reasoning would suggest that inquiry oriented instruction is less likely to be used by ineffective classroom managers. Swami's (1975) findings that science teachers who indicated concern over classroom discipline used fewer inquiry oriented activities than those who did not support this idea.

The responsibility for developing initial teacher competencies in prospective science teachers rests upon the teacher education institutions. Through general education, professional pedagogy, and field experience courses in science teacher education, faculty assist pre-service teachers in acquiring the professional skills needed to be successful in the classroom. These professional skills should provide a foundation for further professional growth during in-service training.

Recent criticisms of science instruction have pointed to a need for science teacher education programs to improve upon the professional skills acquired by pre-service teachers during teacher training. As a result, proposals for changes in current science teacher education and certification standards have been made. Several of these proposals recommend a stronger science content preparation of teachers (NSTA, 1984; Iddings, 1985). Several others recommend extending teacher education beyond the four year time span of most existing programs. Several models for extended programs have been described by the American Association for Colleges of Teacher Education's Task Force on Extended Programs (AACTE, 1984). These models vary in format and length. Some integrate professional education with liberal arts coursework throughout a five or six year time span. Others are designed so that students pursue one year of professional education after completion of a four year liberal arts degree.

Evaluation of a science teacher education program is necessary in order to make judgements about its effectiveness in meeting its objectives. The objectives can be used to guide the evaluation process. From these, desired outcomes can be selected to determine whether or not the objectives have been achieved. Teacher practices in the classroom is one such category of outcomes. Information on teacher characteristics can be gathered in order to help interpret teacher practices. Information on situational variables related to the school, administration, and pupils can be used in a similar manner.

Description of The Ohio State University Science Teacher Education Programs

The faculty of Science and Mathematics Education at The Ohio State University (OSU) currently provides two programs for Ohio secondary science teacher certification. One of these programs is pursued by undergraduate students. This program resulted from a science teacher education program developed at The Ohio State University in 1969. It emphasizes early field experience in schools of contrasting settings. When first established it was referred to as the "project" program. At that time a second, more traditional science teacher education program was also available. This was referred to as the "non-project" program. Currently the "project" program is the only science teacher certification program available at The Ohio State University for undergraduate students. It will be referred to in this study as the Undergraduate Program.

Students enrolled in the Undergraduate Program begin their professional education experiences at the beginning of their junior year. Throughout the junior year students are involved in field work two mornings a week. During the autumn they work on a one-to-one basis with junior high pupils. During the winter students work with small groups of elementary-aged pupils and in the spring they work with high school students involved in laboratory activities. In addition to these field activities students spend part of their mornings observing classrooms and conferring with their cooperating teacher. Approximately 180 hours are spent in the field during the junior year. During the other three mornings students are involved in professional education classes which cover general methods of teaching secondary science, learning theory, and curriculum.

The senior year consists of a two quarter sequence. The first quarter (autumn) field experience is divided between two placements such that students are exposed to different grade levels (middle school and high school) and different settings (urban and suburban). Integrated with field experience are courses taken on-campus in the afternoon. These include science methods and professional development. During a second quarter of the senior year students participate in full-time student teaching.

The second program, referred to as the Post-Degree Program, is designed for those individuals who possess a bachelor's degree in a field other than education. The program provides for those individuals who wish only to obtain secondary science certification as well as for those who desire a master's degree in addition to certification. Certification can be obtained in three quarters provided science content requirements are met prior to the beginning of the program. The program is designed so that students also desiring a master's degree can usually complete the coursework in a minimum of five quarters.

During the first quarter of this program (summer quarter) students are involved in field work in the morning. They are placed in the public schools' summer program where they begin as teacher assistants and assume responsibility for teaching by the end of the experience. Students spend 150 hours involved in field experience during this first quarter. Integrated with the field experiences are courses taken on campus in the afternoon. These courses cover learning theory, general science methods, and basic media skills.

The field experience during the second and third quarter of the Post-Degree Program is the same as that described for the senior year sequence of the Undergraduate Program. The special science methods course taken during the second quarter of the Post-Degree Program is also the same as the one taken by Undergraduate Program students. Beyond these similarities, all Post-Degree students enroll in a science curriculum course and many enroll in a microcomputer course. Neither of these are required or typically taken by students enrolled in the Undergraduate Program.

The Post-Degree Program is designed so that certification requirements should be met at the completion of student teaching. Students desiring a master's degree continue (after student teaching) taking classes in science content areas as well as in education. The program is similar in structure to one of the extended teacher education programs described by AACTE's Task Force on Extended Programs. In this model, pre-service teachers obtain a four year liberal arts degree in a content field. Teacher training begins as a fifth year program and consists of professional pedagogy and field experience. A descriptive outline of the Undergraduate and Post-Degree Programs is found in Appendix A.

As mentioned earlier, one of the goals of science instruction during the last several decades has been the development of inquiry skills. The faculty of Science Education at OSU supports this goal and the philosophy that science should be learned through active participation in the inquiry process. Within both programs pre-service teachers learn about instructional practices which promote inquiry and are encouraged to use these practices during field experiences. Also fundamental to these programs is the idea that a well managed classroom is an essential condition for effective instruction. As with inquiry instructional practices, pre-service teachers learn about and are encouraged to use effective classroom management behaviors.

Within the last 15 years several studies have examined selected outcomes of the various science teacher education certification programs at The Ohio State University. These studies have provided valuable information which has been used for program modification and improvement. The first of the studies was conducted by Sagness (1970). He compared views and teaching practices of pre-service teachers in a program which emphasized early field experience in contrasting settings (the "project program") to those in a more traditional program (the "non-project program"). For his study, Sagness developed instruments to measure a teacher's perception of the appropriateness of inquiry-oriented classroom activities, The Science Classroom Activities Checklist: Teacher Perceptions (SCACL:TP), and the actual classroom behaviors used by a teacher, The Science Classroom Activities Checklist: Student Perception (SCACL:SP).

Brewington (1971) and Cignetti (1971) used the instruments developed by Sagness to follow up first year in-service teachers who had graduated from the project and non-project science teacher education programs. Brewington compared the project and non-project graduates with respect to their views and practices of inquiry-oriented teaching. Cignetti's study was similar to the one conducted by Brewington but focused on comparing Ohio State University first year graduates (project and non-project) to non-Ohio State University graduates.

Brown (1972) conducted a study similar to that conducted by Sagness in that he compared the views toward inquiry and classroom practices of project and non-project pre-service teachers. Brown's research extended the work of Sagness by including personal characteristics of the pre-service teachers and cooperating teacher data. The SCACL:TP was used in Brown's study to collect data on pre-service teachers' views of the appropriateness of inquiry-oriented activities. To measure types of activities actually used, as well as characteristics of the pre-service teacher, Brown developed the Checklist for the Assessment of Science Teacher, CAST. The instrument was developed into two parallel forms; one to be completed by the supervisor (CAST:SP) and one to be completed by pupils (CAST:PP). It measured actual use of inquiry activities, teacher-student relationships and the personal adjustment of the pre-service teacher.

Swami (1975) used the SCACL:TP and the two forms of the CAST to assess whether or not the views, after pre-service training, regarding the appropriateness of inquiry-oriented activities and the activities implemented by graduates of The Ohio State University's science teacher education programs changed with the length of teaching experience. His sample consisted of 86 graduates and represented graduates from the project, non-project, and Post-Degree programs.

Need for the Study

One objective of the Post-Degree and Undergraduate Programs is to produce graduates who both use and value inquiry-oriented science activities during instruction. In addition, the programs are designed to equip graduates with the ability to effectively manage the science classroom. To determine if these programs are effective in meeting these objectives, data on the views and classroom practices of graduates are needed. In addition, data on variables which may be related to the views and practices of the graduates are needed in order to help interpret the findings.

At the time of Swami's study the Post-Degree Program had been in existence only one year. Consequently from his sample of 86 graduates, only 10 were graduates of the Post-Degree Program. Due to this small number it is difficult to make generalizations concerning the views and instructional practices of these graduates from his data.

Students enrolled in the Post-Degree Program are different from students enrolled in the Undergraduate Program. Typically Post-Degree students are older and some may have had experience working in an educational setting before entering the program. In addition, they have taken science content background that differs from an undergraduate science education major. As described above, the content and length of the Post-Degree Program differs from that of the Undergraduate Program. Are these differences reflected in the instructional practices of graduates of the two programs? Data collected on the performance of graduates from both programs can be used to answer this question.

Swami (1975) identified variables which were found to be significantly related to the views and practices toward using inquiry activities. His findings were used to interpret program graduates' views and practices. It would be helpful to extend his findings by identifying additional variables which are also related to such views and practices. If any of these variables could be controlled by the teacher education programs, the findings could be used for future program modifications.

No data have been collected regarding the classroom management practices of the graduates from either program. This is an important aspect of teacher performance. Data on management practices could be used for assessing and comparing outcomes. Identifying variables related to classroom management would help to interpret these practices.

Statement of the Problem

The purpose of this study is to assess outcomes of two secondary science teacher education programs at The Ohio State University in order to evaluate the effectiveness of the two programs in meeting selected objectives. Specifically it will examine and compare instructional and classroom management practices of teachers who graduated from the two programs. Further, this study will examine the relationship between other selected variables and the three criterion variables; views toward appropriateness of selected instructional activities, use of these activities in the classroom and the use of effective classroom management practices.

Definition of Terms

1. Post-Degree Program This refers to the current science teacher certification program at The Ohio State University for students possessing a bachelor's degree. The program may lead toward a master's degree as well as certification if the student meets graduate school requirements and elects to apply for and is accepted for graduate work.

2. Undergraduate Program This refers to the current science teacher education program at The Ohio State University for undergraduate students.

3. Program Graduate This refers to an individual who received science certification through The Ohio State University. When needed, a distinction will be made between the two teacher training programs by referring to an individual as either an Undergraduate Program graduate or a Post-Degree Program graduate.

4. School Administrator A school employee, such as a principal, department head, or curriculum coordinator, whose responsibility is to supervise, coordinate, or evaluate educational personnel and/or programs.

Hypotheses

Hypothesis 1. Teacher graduates of the Undergraduate and Post-Degree Programs will not differ significantly in their views toward the appropriateness of instructional practices to be used in the science classroom.

Hypothesis 2. Teacher graduates of the Undergraduate and Post-Degree Program will not differ in the instructional practices they use in the science classroom.

Hypothesis 3. Teacher graduates of the Undergraduate and Post-Degree Program will not differ significantly in the classroom management practices they use in the science classroom.

Hypothesis 4. There is no significant relationship between instructional practices and classroom management practices used by program graduate teachers in the science classroom.

Hypothesis 5. There is no significant relationship between selected program graduate teachers' characteristics or situational variables and their views toward the instructional practices which should be used in the science classroom.

Hypothesis 6. There is no significant relationship between selected program graduate teachers' characteristics or situational variables and the instructional practices they use in the science classroom.

Hypothesis 7. There is no significant relationship between selected program graduate teachers' characteristics or situational variables and the classroom management practices they use in the science classroom.

Instruments

The following instruments will be used to collect data for this study:

NAME	ABBREVIATION
Science Classroom Activities Checklist: Teacher's Perception	SCACL:TP
Checklist for the Assessment of Science Teachers: Pupils' Perception (Subscale A and B)	CAST:PP
Student Classroom Rating	SCR
Teacher Questionnaire	T.Q.
Student Questionnaire	S.Q.
Administrator Questionaire	A.Q.

List of Variables

Criterion Variables	Instrument
Views toward appropriate instructional practices	SCACL:TP
Instructional practices used in the classroom	CAST:PP-B
Classroom management practices	SCR
Predictor Variables	
Teacher Characteristics	
Age	T.Q.
Degree received	T.Q.
Grade point average	T.Q.
Years of teaching experience	T.Q.
Student-teacher relationship	CAST:PP-A
Involvement in curriculum development committees	T.Q.
Recency of college attendance	T.Q.
Involvement in professional organizations	T.Q.
Pupil control ideology	T.Q.
Contextual Variables	
Related to students or class:	
Subject of class	T.Q.
Size of class	T.Q.
Number of preparations per day	T.Q.
Student's attitude toward science as a school subject	S.Q.

Contextual Variable (cont.)	Instrument
Related to students or class: (cont.)	
Student's attitude toward this class	S.Q.
Type of class (modified, average, advanced)	T.Q.
Student's science achievement relative to other classes	S.Q.
Student's grade in class	S.Q.
Student's sex	S.Q.
Adequacy of supplies and facilities: Teacher perceived	T.Q.
Textbook used	T.Q.
Use of supplementary curriculum materials	T.Q.
Teacher perceived constraints to effective instruction	T.Q.
Related to the community:	
Scoio-economic level	A.Q.
Type of setting (urban, suburban, rural)	A.Q.
Related to the administration:	
Administrator's view toward his/her instructional role	A.Q.
Administrator's view of appropriate goals, curricula and methods for science instruction	A.Q.
Teacher's view of instructional guidance received from administrator	T.Q.
Teacher's view of administrator's assistance in handling discipline	T.Q.
Administrator's pupil control ideology	A.Q.

Assumptions

1. The instruments used in this study accurately measured the constructs they are purported to measure.

2. In-service program graduates' answers on instruments assessing their views toward appropriate instructional practices reflected actual attitudes and not those perceived to be desired by the investigator.

Delimitations

1. The sample used in this study was restricted to graduates of the Undergraduate and Post-Degree Programs who received certification between Spring Quarter 1980 and Summer Quarter 1985, and who were employed as full-time secondary science teachers in the United States during the time of this study.

2. Individuals used in this study were volunteers and not randomly selected to participate.

3. No attempt was made to determine the influence of classroom practices on student outcomes.

CHAPTER II

REVIEW OF THE LITERATURE

This chapter is divided into two sections. The first section focuses on results of research studies conducted in the area of classroom management. Studies designed to identify effective practices, examine the effects of training and identify variables related to classroom management are reviewed. The second section focuses on results of studies in which variables related to selected instructional practices were examined. Such variables include classroom management, teacher characteristics and the school environment. Included in this section are results of doctoral research studies in which the instructional views and practices of in-service science teachers graduated from The Ohio State University were investigated.

Research on Classroom Management

Studies of Effective Classroom Management Practices

Since the 1970's a number of research studies have been conducted in order to identify teacher behaviors that constitute effective classroom management practices. These studies have been conducted in a wide range of subjects and grade levels. A small number of such studies have been restricted to science classrooms and are reviewed at the end of this section.

Review of studies not restricted to science classrooms. Prior to the 1970's classroom management was generally viewed as being synonymous with classroom discipline. Emphasis was placed upon describing behaviors that teachers should use when dealing with students who misbehave. Classroom management research took on a new perspective when a landmark study conducted by Kounin (1970) discovered that good classroom managers do not sharply differ from poor managers in how they deal with student misbehavior but differ primarily by using techniques that prevent student misbehavior. By analyzing videotapes of elementary classrooms, Kounin was able to identify specific categories of teacher behavior that correlated with management success. He defined management success, and hence effective management practices, as those teaching behaviors which produced high levels of student involvement in classroom activities and minimal levels of unsanctioned student behavior. Kounin grouped these teacher behaviors into several dimensions. These were withitness, overlapping, transition smoothness and momentum. The correlation between the frequency of the teacher behavior during recitation and/or seatwork and the criterion variables (student work involvement and freedom from unsanctioned behavior) ranged from 0.26 to 0.69.

Withitness refers to a teacher's ability to communicate to students an awareness of students' behavior. Teachers rated high in this dimension stopped inappropriate behavior quickly. They also constantly monitored the classroom and stationed themselves where they could view all areas of the classroom.

Overlapping refers to a teacher's ability to deal with more than one event at a time. Effective managers were found to be capable of conferring with a small group of students and at the same time of continuing to monitor the rest of the class.

Transition smoothness and momentum deal with a teacher's ability to move from one activity to another without interruptions in the flow of activities. Kounin found teachers possessing this behavior were well prepared, always informed students as to what to do next, and ignored minor student inattentions. In addition, they avoided slowing down the whole class by overdwelling upon student misconduct or by staying on a topic longer than necessary for student understanding.

The work conducted by Kounin identified management behaviors that were used by effective managers in order to maintain well managed classrooms. His research did not, however, identify how effective managers organized and maintained their classroom at the beginning of the school year. Subsequent research conducted at the Research and Development Center for Teacher Education at the University of Texas-Austin examined this issue by identifying how effective managers communicated expectations and established desired rules and procedures at the start of the school year. One such study was the Classroom Organization Study (COS). This year long descriptive study was designed to study the initial phase of classroom organization and management (Emmer, Evertson, and Anderson, 1980; Anderson, Evertson, and Emmer, 1980). Twenty-seven third grade teachers and their classrooms were observed intensively during the first three weeks of the school year and at three or four week intervals throughout the year. Data collected by trained observers included narrative records of classroom processes, ratings of student engagement, teacher behaviors and a log of time use. Based upon these data, teachers were classified into two groups of teachers who had initially comparable classes but differed in their management effectiveness as the year progressed.

Frequencies of the activities used by the more and less effective managers were compared statistically using t-tests. Results of this analysis showed that beginning of the year activities of effective managers differed significantly from less effective managers. Effective managers established rules and procedures that served to guide students in a variety of classroom activities. These rules and procedures were carefully taught to the students during the first three weeks of school. During this time a considerable amount of time was spent reminding students of these guidelines. Effective managers were consistent in using the rules. They incorporated the teaching of rules and procedures as an important part of instruction during the first few weeks of school. This was accomplished by providing practice, giving feedback, responding to signals and pointing out to students when they were behaving appropriately. In addition, effective managers carefully monitored student behavior and were consistent in dealing with inappropriate behavior. In contrast, ineffective teachers did not establish well developed procedures.

This was particularly true among first year teachers. Rules that did exist were not stated clearly, and these teachers were less effective in monitoring their classes.

A second descriptive study from the Research and Development Center at the University of Texas-Austin was conducted in junior high mathematics and English classes (Evertson and Emmer, 1982). This study began by identifying two groups of junior high mathematics and English teachers as being more or less effective in their classroom management practices. Data for selection into the two groups included student achievement and student behavior. Results of analysis of variance (ANOVA) found significant differences between the two groups with respect to student involvement in classroom activities, occurrence of inappropriate student behavior and class achievement.

The two groups of managers were observed during the first three weeks of school to assess differences with respect to the teachers' antecendent behaviors, characteristics and classroom activities. Ratings on these variables were compared using a series of two-way ANOVAs (more versus less, math versus English). Results showed that, regardless of content area, there are several broad clusters of variables differentiating more and less effective managers. More effective managers set clear expectations of student behavior, academic work standards and classroom procedures during the first few weeks of school. Effective managers monitored student behavior closely and quickly dealt with student misbehavior. In addition, they were clear in communicating directions and organizing instruction. The results from this junior high study were similar to those obtained at the elementary level. Differences were primarily a matter of making adjustments to age level, subject and type of classroom grouping.

By conducting a case study on three of the teachers used in the above junior high school study, Sanford and Evertson (1981) identified the behaviors used by highly effective and less effective teachers in low socio-economic status (SES) schools. Their results showed that the patterns of teacher and student behavior in low SES schools were similar to those found in other schools, with one exception. The exception dealt with the amount of time spent teaching rules and procedures. In the case study examining low SES schools, the teacher who was effective in managing the classroom spent more time than others teaching about classroom rules and procedures. This finding was not supported when studying junior high schools of higher socio-economic status. In the higher SES schools, more and less effective managers did not differ in the amount of time they devoted to teaching classroom rules and procedures.

Review of studies restricted to science classrooms. Four studies which focused on identifying effective management practices in science classrooms are reviewed in this section. One of these studies was conducted by Sanford (1984). She examined classroom management and organization in junior high science classrooms. Using a procedure similar to the one used by Evertson and Emmer (1982, reviewed on pages 23-24), Sanford identified a large number of management variables which were significantly correlated to high levels of student engagement and low levels of disruptive, off-task behavior. These management variables were grouped into four categories; classroom procedures and rules, student work procedures, managing student behavior and organizing instruction.

Procedural variables found to correlate to student engagement and off-task behavior were as follows: using appropriate general procedures, efficiently opening and closing class, and infrequency of students calling out for teacher's assistance. Correlations for these variables ranged from 0.68 to 0.95. In the area of student work procedures, enforcing work standards, establishing routines for assigning work, and checking student work were significantly correlated (r=0.69 to 0.91) to the criterion variables. In the areas of managing student behavior, the variables consistency and quickness in responding to student misbehavior, effective monitoring of behavior, and low levels of students wandering about the classroom showed high correlations (r=0.67 to 0.95) to the criteria for management success. Another set of variables dealt with teachers' practices in organizing and pacing instruction. The most highly correlated variables (r=0.61 to 0.89) in this category were stating objectives clearly, appropriate pacing of lessons, clear explanations and efficient transitions.

After identifying teacher behaviors related to student on-task and off-task behavior, Sanford divided the teachers into three groups; most, moderate and least effective managers. These three groups were further observed to investigate how they managed typical science classroom activities. The mean frequency of occurrence of several management variables were compared for the three groups. Sanford found that regardless of the activity, certain patterns of behavior were found to be characteristic of the effective managers in science classrooms. These patterns were efficient classroom procedures and routines, skill in managing group work, quickly stopping inappropriate behavior and wandering about in the classroom, clear communication, and appropriate pacing of activities. These patterns were similar to the ones that Evertson and Emmer (1982) found to be used by junior high math and English teachers who were effective in classroom management.

Several other studies have focused on effective management behavior used in science classrooms. Tobin (1984) examined teacher behaviors which were associated with student engagement rates in middle school science classrooms. Seven management behaviors, listed below, were found to be significantly related (r=0.54 to 0.76) to student engagement.

1. Uses teaching methods appropriate for objectives, learners, and environment.
2. Gives directions and explanations related to lesson content.
3. Demonstrates ability to work with individuals, small groups and large groups.
4. Provides learners with opportunities to participate.
5. Reinforces and encourages the efforts of learners to maintain involvement.
6. Attends to routine tasks.
7. Maintains appropriate classroom behavior.

McGarity and Butts (1984) conducted a similar study with 30 junior high and high school science teachers. Their results were similar to the findings of Tobin. In addition to identifying management behaviors associated with student engagement and achievement, they found that the relationship between these two variables was consistent across differing levels of student aptitude.

Beasley (1983) examined classroom management behaviors of science teachers in order to identify the relationship between these behaviors and task involvement of students in small group laboratory settings. Teacher behavior was classified as being directed in one of three ways; whole class, small group and non-class related. Results from video tapes of 24 science classrooms found that teachers who operated at the whole class level had classes with a higher degree of task involvement. Teachers who responded to pupil requests by spending considerable time interacting at the small group level were found to have classes with lower student task involvement. Previous studies of classroom management practices have found that in elementary grades as well as junior high mathematics and English classes, monitoring the entire class is an effective approach to classroom management (Emmer, Evertson, and Anderson, 1980; Anderson, Evertson, and Emmer, 1980; Evertson and Emmer, 1982; and Sanford and Evertson, 1981). Results of this study suggest that it is also an effective practice to be used with small group laboratory activities in the science classroom.

Effects of Training on Management Practices

Experimental studies in classroom management have been conducted to determine the effects of teacher training on classroom management practices. Of the studies identified in this section, none were found to deal exclusively with science teachers.

Anderson, Evertson, and Brophy (1979) conducted an experimental study of first grade reading groups in middle class schools to determine the effect of classroom management training on teacher management behaviors. The treatment was based on an instructional model consisting of 22 principles thought to promote effective management. A manual describing this model was given to 17 first grade teachers who agreed to use it. Ten other teachers served as the control group. All of the teachers were female. The study measured the effects of the treatment on student achievement and teacher behavior. Results found achievement scores for the treatment group were higher than the control group. The study also found that some aspects of teacher behavior associated with the model were used significantly more frequently by the treatment teachers than by the control teachers.

Evertson, Emmer, Sanford, and Clements (1983) reported on the results of an experimental field study, the Classroom Management Improvement Study (CMIS), conducted to determine the extent that training and materials help elementary teachers become more effective classroom managers. One large urban and one small suburban school participated in this study. Thirty-five teachers, all volunteers, were randomly assigned to treatment groups. These teachers varied in the number of years experience (0-12 years) and grade level taught (primary and intermediate). Treatment consisted of two workshops at the beginning of the school year to introduce teachers to classroom management principles and to orient them to the manual. The manual, which provided guidelines and principles for classroom management, was based upon the results of the Classroom Organization Study (Emmer, Evertson, and Anderson, 1980) which identified effective classroom management practices.

Teachers were observed intensively during the first few weeks of school and throughout mid-February. Data on student and teacher behavior were collected to assess the effects of the treatment on student engagement and teachers' use of recommended management behaviors. Results showed that teachers who received the manual and participated in the two workshops did use the recommended behaviors more frequently that the control group. In addition, the classes taught by the treatment teachers had significantly fewer incidences of inappropriate student behavior and a significantly greater proportion of students engaged in appropriate tasks than did classes taught by the control group. A study similar to the CMIS but conducted at the junior high level obtained similar results (Emmer et al., 1982).

The effects of training on classroom management style was also studied by Cheser et al. (1982). In this study, the investigators examined the effects of a graduate in-service course on classroom management and school discipline on teachers' attitude toward behavior problems. The experimental group consisted of 85 in-service teachers (teaching in grades K-6) enrolled in a graduate course. The course focused on knowledge and skills in dealing with various discipline problems as well as the development of a philosophy of discipline. The control group consisted of graduate students at the same institution. At the completion of the course the participants were asked to complete the Behavioral Consequence Preference Survey (BCPS). The survey, validated by a panel of experts, measured a teacher's attitude toward using effective management practices. Results of the study found that those students who participated in the management course scored significantly higher (more effective) on the BCPS than did the control group.

Variables Related to Classroom Management Style

Teacher-related variables. Numerous studies have examined teacher-related variables and their relationship to classroom management style. These studies have focused on examining characteristics of teachers teaching in a variety of content areas and grade levels. An overview of several of these is included in this section. Only two studies were identified which focused exclusively on science teachers.

The personality characteristics of teachers is one category of teacher variables which has been studied to determine its relationship to classroom management. An effort to discover such a relationship was made as part of the Classroom Organization Study (described in the preceding section) when Emmer, Evertson, and Anderson (1980) attempted to determine if there were selected personality differences between effective and ineffective classroom managers at the elementary level. By examining the data collected within the first three weeks of school, they found no significant differences between effective and ineffective managers on the personality variables of warmth, enthusiasm, composure, ability to articulate, anxiousness and critical attitude. However, teachers who were more effective in their management practices were found to exhibit better affective skills related to listening and expressing feelings.

Sanford (1984) examined personality characteristics of junior high and high school science teachers and related them to management behaviors. Of the variables she measured, only one variable, teacher confidence, was found to be associated with management effectiveness. The variables enthusiasm, warmth, showmanship and listening skills were found to not be related to management success. These results support Emmer, Evertson, and Anderson's (1980) findings concerning the lack of a relationship between management success and the variables enthusiasm and warmth at the elementary grade level. However, Sanford's results indicate that the relationship found between management success and listening skills by Emmer, Evertson, and Sanford (1980) at the elementary level does not exist at the junior high level.

Smith (1981) also examined personality characteristics and how they relate to management style. The personality characteristics he examined were locus of control, dogmatism, Machiavellianism and state-trait anxiety. Smith defined locus of control as an individual's feeling as to whether or not circumstances are beyond his/her control, and dogmatism as a measure of an individual's degree of openness to new or alternative ideas. In addition he defined Machiavellianism as an individual's tendency to manipulate others in interpersonal situations and anxiety as a state, a temporary condition; or a trait, a more permanent condition. Management style was based upon an induction-sensitization paradigm of socialization. An inductive approach to classroom management is characterized by an emphasis on the child's responsibility in behavioral situations, use of positive reinforcement, ignoring inappropriate behavior when possible and using strategies that foster an internal locus of control in the student. The sensitizing style of classroom management is characterized by little support for the child's responsibility and role in managing behavior, emphasis on punishment of misbehavior, and relying on an external control of students' behavior.

Subjects for his study consisted of elementary classroom teachers and pre-service education majors. They were asked to complete questionnaires designed to assess the above mentioned personality characteristics. Results of this study showed no significant differences between the classroom teachers and education majors with respect to their classroom management styles. Significant gender differences were found with males displaying a more inductive style of management. Results of analysis of the four personality variables showed that an inductive approach to management was associated with an internal locus of control and an openness to new ideas for the pre-service teacher group. There were no significant relationships found between the four personality variables and classroom management style for in-service teachers.

One dimension of classroom management deals with the means with which a teacher controls students. The Pupil Control Ideology (PCI) (Willower et. al., 1967) is used to assess this dimension of classroom management by measuring a teacher's orientation toward controlling student behavior. Teacher control orientation is measured along a continum from custodial to humanistic. Teachers with an custodial orientation stress the maintenance of order, impersonal relationships with students, distrust of students and a punitive attitude. Teachers with a humanistic orientation are more accepting and trusting of students, and have confidence in students' ability to be self-disciplining and responsible.

Using the PCI, Rose and Willower (1981) tested the hypothesis that teachers' personality characteristic "sense of power" would be positively associated with a consistency in their belief and behavior toward controlling students. In addition they tested the hypothesis that teachers' sense of power is positively related to humanistic pupil control ideology and behavior. The investigators found that teachers' sense of power was not correlated to pupil control ideology and behavior but it was positively correlated to the degree of congruence in their pupil control ideology and behavior. In addition, they found age and pupil control behavior were significantly related in that older teachers tended to be more custodial in their approach to controlling students.

Halpin, Halpin, and Harris (1982) examined the relationship between a number of selected personality characteristics of teachers and their pupil control orientation. The subjects, 110 education students, were rated on 16 personality factors as well as their pupil control orientation. The results of this study revealed nine personality variables which were significantly related to a humanistic control orientation. These variables were emotional stability, expediency, imaginative, happy-go-lucky attitude, self-assured, high self concept, outgoing, relaxed and venturesome.

In an earlier study, Lunenbury and O'Reilly (1974) found that among elementary teachers, dogmatism and pupil control orientation were related. These investigators found low dogmatic (open-minded) teachers were significantly more humanistic in their pupil control orientation than high dogmatic (close-minded) teachers.

Lovegrove and Lewis (1982) studied the pupil control procedures used by ninth grade teachers who were characterized as being relationship-centered. A teacher's relationship skill rating was obtained from student response to a questionnaire. To investigate which classroom management practices were closely associated with teacher relationship skills, the teachers were divided into three groups; high, medium and low on relationship skill based upon student ratings. Results of the study indicate that relationship-centered teachers engage in classroom management practices characterized by non-abrogation of responsibility, fairness and calmness.

Rust and Kinnard (1983) also examined variables related to the means by which teachers control students. Their criterion measure of this dimension of classroom management was the use of corporal punishment. They tested for a relationship between four personality variables of educators; dogmatism, extraversion, neuroticism and psychoticism with the use of corporal punishment among 114 educators (teachers and administrators) working in grades K-12. Results indicated that the personality characteristics of close-mindedness and neuroticism were highly correlated with the use of corporal punishment. A significant correlation was also found between years experience in teaching and use of corporal punishment. The other two variables, extraversion and psychoticism, were found to be only slightly or insignificantly related.

Teaching experience is another teacher variable which has been investigated to determine its influence on classroom management practices. Results of a study by Moser (1982) suggests that the attitudes toward discipline change as a result of student teaching experience. In this study 53 student teachers at the elementary level were asked, prior to student teaching, to indicate the method of control they intended to use. At the completion of student teaching they were asked to indicate the types of control methods they actually used. The results indicate that the student teachers were more willing to use harsher methods of discipline after the student teaching experience.

Looking exclusively at science pre-service teachers, Jones and Harty (1981) also found that student teaching experience influences pupil control ideology. They investigated the influence of the student teaching experience on the classroom management-pupil control ideology of secondary pre-service science teachers. The pupil control ideology of 19 subjects was measured before and after student teaching. No significant changes in pupil control ideology were found for the subjects as a group or when divided by gender. However, significant changes did occur when data were examined by subject taught. Results showed that individuals who taught the individualized, inquiry-oriented Intermediate Science Curriculum Study (ISCS) in grades seven through nine became more custodial after student teaching while those who taught high school biology showed no change.

Jones (1982) examined the influence of the grade level at which student teaching occurs as well as the length of the student teaching experience on student teachers' pupil control ideology. The investigation examined two levels of the length of student teaching (8 weeks or 16 weeks) and two levels of the grade level taught (elementary or secondary). A total of 62 pre-service teachers completed the PCI instrument before and after student teaching. Analysis of the data indicated that student teachers at the secondary level, regardless of the number of weeks of student teaching, became more custodial in their pupil control orientation as a result of the student teaching experience. There was no significant change in the pupil control orientation for student teachers at the elementary level.

Contextual variables. A variety of variables related to the school, administration and students have been examined in an attempt to identify relationships between such variables and teachers' management styles. Several of these studies, which are relevant to this study, are highlighted in this section.

Research by Estep (1980) examined the relationship between the type of school district and teachers' pupil control ideology and behavior. Results found that teachers teaching in suburban districts were more humanistic in both pupil control ideology and behavior than were teachers in small-town rural districts.

A study conducted by Galligan (1980) examined variables related to the school administration to determine if a relationship exists between these variables and classroom management practices of teachers. Specifically, Galligan tested the hypothesis that there is a significant relationship between a principal's leadership priorities and a teacher's classroom management skills. The hypothesis was based upon the Path-Goal Theory which states that the relationship between leader and subordinate behavior is dependent upon particular contingencies of the situation. The contingency or situational variables considered in this study were the subject matter taught (mathematics or English) and the number of years the teacher and principal had worked together. The leadership priorities measured were the degree of relationship- or task-orientation of the principal. The criterion measure was the classroom management skills of the teacher. Data for this study were collected as a part of the Junior High Classroom Organization Study (JHCOS), a study of classroom management effectiveness of junior high English and mathematics teachers (Evertson and Emmer, 1982). Fifty-one teachers volunteered to participate. To assess classroom management skills, the Observer Ratings of Teachers (ORT) was used. This instrument, which contained

303 questions dealing with a variety of classroom activities, was factor analyzed to obtain one factor which dealt with classroom management strategies. A questionnaire was developed to assess a principal's leadership orientation. The results obtained support the Path-Goal model in that all of the relationships between classroom management skills and principal's orientation varied depending upon the number of years experience that a teacher had worked with a principal and the subject matter taught.

Student attitude is another category of contextual variables which has been examined to determine its relationship with classroom management. Several studies suggest a relationship does exist between management practices and student attitude toward the classroom environment. Fisher and Fraser (1983) found that classrooms characterized as being well organized, with set procedures and rules are preferred by junior high students. In their study, students in 116 junior high classrooms were asked to characterize the classroom environment they perceived existed and the one they preferred by responding to two instruments, the Individualized Classroom Environment Scale (ICES) and the Classroom Environment Scale (CES). The ICES measures perceptions of classroom environment ranging from individualized (open) to traditional. The CES is designed to measure perceptions of psychosocial aspects of the classroom. Based upon student responses to these instruments, classrooms which were preferred by students were rated high in task orientation, rule clarity and student involvement. Studies in the area of classroom management have shown that these psychosocial aspects are also characteristic of effectively managed classrooms.

The CES was used by Hardy and Hassan (1983) to examine the relationship between Sudanese secondary science teachers' pupil control ideology and their students' perception of the psychosocial environment of their classroom. No significant relationship between these two variables was found. However, further analysis between the PCI scores of teachers labeled custodial and students' perceptions of the environment revealed a significant negative relationship between a teacher's custodialism and students' perception of the extent to which the teacher was willing to express personal interest in students.

Evertson, Emmer, and Brophy (1980) provide data to suggest that students' attitude toward their teacher is influenced by the teacher's management practices. In their study a group of three highly effective managers and a group of six ineffective managers were identified. Students in these teachers' classes were asked to complete a questionnaire which assessed their perception of their teacher's knowledge of the subject, interest in knowing students, and whether or not the student enjoyed the class, learned much in the class, or felt comfortable approaching the teacher for help. Results found that the three effective teachers were rated higher by their students on these questions than the less effective managers.

Summary

The studies reviewed in this section have revealed several broad categories of management practices that foster conditions for effective learning by increasing student involvement and decreasing the frequency of unsanctioned student behavior. These categories deal with developing and maintaining rules and procedures, skill in managing student behavior and organizing instruction.

One important component of science instruction is laboratory activity. Managing a classroom during laboratories may be particular demanding due to the complex nature of such activity. Studies of effective management in science classrooms indicate that teaching practices that are effective in managing secondary science classrooms are similar to those used in other content areas. Differences that do exist, exist more in terms of the importance placed on certain management skills. Thus, Sanford (1984) suggests that management skills of particular importance for science classrooms are efficient procedures and routines, skill in managing group work, quickly stopping inappropriate behavior, clear communication and appropriate pacing of instructional activities.

Efforts to develop management skills among in-service teachers have been shown to be successful. Studies conducted to train teachers to use effective classroom management practices have found increased frequencies of teachers' behaviors associated with good management as well as increased student achievement and decreased levels of unsanctioned student behavior.

Results of research studies have shown that classroom management behavior are influenced by a number of teacher-related and situational variables. The teacher-related variables include personal characteristics and professional attitudes of the teacher. The situational variables have been found to include the school setting as well as administrator and student attitudes. Although studies have been conducted to reveal variables related to classroom management practices only a limited number were found in the literature. More studies examining additional variables would add to what is already known about the factors which influence management practices.

Research on Instructional Practices

Management Variables Related to Instructional Practices

Studies examining the relationship between classroom management and instructional practices support the idea that management style is related to instruction. One such study, conducted by Jones and Harty (1978), investigated classroom management and instructional preferences of secondary science teachers to determine the influence that management style has on the type of instructional activities used in the classroom. Forty-four in-service teachers responded to the Pupil Control Ideology (PCI) as well as an instrument designed to assess preference for inquiry or traditional methods of teaching. Results indicated a significant positive correlation (r=0.32) between a teacher's degree of custodial student control ideology and preference for traditional methods of instruction.

Several studies have shown that management success is also related to instruction. Studies of classroom management have demonstrated that effective management practices result in higher levels of student cooperation (as measured by engaged time) and achievement than less effective practices. Good (1983) provides evidence which indicates that these student outcomes influence teachers' decisions as to the types of activities they choose to use as well as the amount of time spent on such activities. He found that teachers who were getting lower-than-expected achievement gains from their students tended to rely much more on seatwork activities.

Additional support for the idea that management success influences instruction is provided by results of a study conducted by Evertson, Emmer, and Brophy (1980). They reported that in a sample of junior high mathematics teachers, differences existed in the proportion of time allocated to various instructional activities between more effective and less effective teachers. More effective teachers used approximately half of each class period for lecture-demonstration and discussion, and somewhat less time for individual seatwork. Teachers rated as less effective managers used approximately one-fourth of the period for lecture-demonstration and discussion, and more than half of each period for seatwork.

Similar results were found by a study conducted at the elementary level (Anderson and Barufaldi, 1980). In this study 57 science lessons taught by 22 elementary teachers were observed and data on teacher (as well as student) behaviors were collected. In general, the observed teachers reported a concern with maintaining order during science lessons and that this concern impacted upon their choice of organization format for instruction. Teachers were found to be most successful in controlling students during whole class discussion. They also allocated almost two-thirds of the science class time to this format of instruction. The investigators also reported that management concerns impacted upon a teacher's choice of instructional materials. Teachers' rating of management difficulty of science lessons using manipulative materials was significantly higher ($p < .10$) than their ratings for lessons in which manipulative materials were not used. The investigators also found that these teachers either avoided or used less successfully (i.e. had a larger proportion of students off-task) manipulative science materials.

Non-management Variables Related to Instructional Practices and Attitudes

Every day science teachers make instructional decisions which impact upon student outcomes. There is evidence that what teachers value will influence these decisions and hence the outcomes of science education. Support for this idea comes from Stake and Easley (1978) who found that teachers' "...ideas were continuing to be the prime determinant of what went on the classroom" (p. 12). Numerous studies have focused on factors which influence teachers' attitudes and use of various methods of instruction. This section reviews results of several of these studies.

Factors influencing attitudes toward instruction.

Several researchers have examined the relationship between teacher characteristics and attitudes toward inquiry instruction. Moore (1982) attempted to determine the influence of the phase of concern (self, task, or impact concern) and preference toward teaching science on elementary pre-service and in-service teachers' attitude toward teaching student-centered science. Moore found a significant relationship between elementary teachers' concern phase and attitude toward teaching student-centered science but no relationship between such attitude and the independent variable, preference for teaching science.

Variables influencing innovative attitudes of science teachers was examined by Darrow (1972). He tested for differences in selected characteristics among secondary science teachers who favored innovative science curricula and teachers who did not favor such curricula. Teacher responses to a survey were tabulated and treated for significant differences between groups using a chi-square analysis. Results of his study found significant differences between the two groups of teachers with respect to the extent of participation in non-college credit activities designed to study innovative science curricula. Participation in conferences, meetings, institutes and other non-college credit pedagogical activities were found to be positively related to favorable attitudes toward innovative science curricula.

Lazarowitz et. al. (1978) examined demographic (age and gender) and background variables (desire to teach, GPA, class rank and semester hours in science and education) and their relationship to inquiry attitudes among both elementary education and science education pre-service teachers. Forty-four secondary science education majors and 98 elementary science education majors completed a personal data sheet and the Inquiry Science Teaching Strategies (ISTS) instrument. This instrument was designed to assess attitudes toward inquiry instruction. Responses to the personal data sheet were used to group teachers on the various independent variables and a series of one-way ANOVAs were performed to determine if there were significant differences in attitudes toward inquiry between groups. The investigators found that for secondary science pre-service teachers, the number of hours taken in science was related to a positive attitude toward inquiry ($p < .01$). For the elementary education pre-service teachers, desire to teach, age, GPA, class rank and number of semester hours completed in education were associated with positive attitudes toward inquiry (levels of significance ranged from .01 to .10). Based upon these results, the investigators suggested that different characteristics are associated with positive attitudes toward inquiry between individuals preparing to teach at the elementary level and at the secondary level.

Blankenship (1964) studied the impact of several demographic and background variables on attitudes toward inquiry of high school science teachers. He examined the influence of age, number of semester hours of undergraduate biology credit completed, number of years experience and nine psychological measures on 75 teachers' reaction to the Biological Sciences Curriculum Study (BSCS) Program after special training in the program. Analysis of the data revealed that, in general, teachers who ranked higher on the measures of independent thought and action, and who had taught high school biology for three years or less reacted positively to the BSCS Program.

Further evidence for the influence of personality on preference for inquiry instruction among second year science teachers is provided by Shay (1974). In this study, data on in-service teachers were collected using the Myers-Briggs Type Indicator, Rokeach Dogmatism Scale and a teacher questionnaire. Additional information was collected on student and administrator variables. Results showed that teacher preference for student-centered instruction was significantly associated ($p < .01$) with being female, intuitive, recognizing the implications of such a choice in the preferred teaching role and current use of student-centered methods.

The personality characteristic of dogmatism in elementary teachers and its relationship to teacher behaviors associated with inquiry was investigated by Bird (1970). Results of this study found that close-minded teachers exhibited fewer behaviors consistent with providing students an opportunity to learn through inquiry than open-minded teachers. Specifically, close-minded teachers spent more time asking questions of large groups, giving information to students and providing rhetorical questions, giving directions on how an activity should be done, and suggesting alternatives to students than did open-minded teachers.

Factors influencing instructional practices. In addition to exploring the relationship between selected variables and teacher's attitude toward various methods of instruction, numerous research studies have examined the relationship between similar selected variables and the actual method of instruction used in the classroom. One such area of research deals with the influence of school environmental factors on instructional practices. Such factors include administrative support, ability level of students, class size, facilities and the student-teacher relationship.

James (1978) investigated factors in the school environment which science teacher perceived to affect innovative science teaching. Data were collected by interviewing 130 teachers in the greater New York area. Information concerning the school environment included the socio-economic status of the school community, administrative organization, academic atmosphere and resources of the school. The study found that teachers perceived the following nine factors to influence their innovativeness in science instruction:

1. Small class size
2. A good student-teacher relationship
3. Observable pupil involvement
4. Principal's attitude and support of innovative practices
5. Expected behavioral and academic performance by students
6. Security in their jobs
7. Access to support facilities
8. Availability of free time
9. Money to purchase teaching materials

Class size, an environmental variable which James found to influence instruction, has also been examined in a number of other studies. An early study by Whittsitt (1955) compared instruction in small (less than 24 students) and large (more than 34 students) high school English and social studies classes. He found that in small classes, teachers used more group oriented instruction, more supplementary curriculum materials and a greater variety of instructional methods. The relationship between class size and use of a variety of instructional techniques found in this study was also found in a later study conducted in grades K through 12 by Pugh (1965).

The effect of class size and ability level of students on the instructional activities used by elementary student teachers during science lessons was examined by Yeany (1976). The Elementary Science Activities Checklist (ESAC) was used to assess the teaching strategies used by 64 student teachers, as perceived by their pupils. The ESAC was developed earlier by Yeany from Korchendorfer's (1966) Biology Classroom Activities Checklist (BCAC). Results showed no significant correlation between scores on the ESAC and class ability (r=0.21, n.s.) or class size (r=0.10, n.s.). This indicated that the elementary student teachers did not adjust their science teaching strategies in relation to ability level of their students or to class size. Yeany suggested that perhaps these findings were a result of student teachers not having had enough experience to have learned to adjust their behavior to the learning environment or perhaps they do not, as yet, possess a large enough repertoire of teaching methods to select a strategy appropriate for the situation.

To determine if high school in-service science teachers with experience change their teaching strategies in response to students of varying academic aptitude levels, Sanford (1977) asked the students of 15 biology teachers to complete the Biology Classroom Activities Checklist (BCAC). The responses were then compared to class aptitude level as measured by the mean class IQ. No significant correlation was found between the use of inquiry strategies (as reflected by the BCAC total score) and class aptitude level. However, significant positive correlations were found between class aptitude and the BCAC subscale scores A (Role of the Teacher), D (Use of Tests), E (Lab Preparation) and F (Laboratory Activities). Significant differences were also found when BCAC total scores for the 15 different teachers were compared. Sanford concludes that in this study, teacher characteristics appeared to be more significant determiners of the extent of use of inquiry strategies than were academic aptitude level of classes.

Evertson (1982) examined the influence of student achievement level on instructional activities used in junior high English and mathematics classes. Data were taken from the Junior High Classroom Organization Study (Evertson and Emmer, 1982). Results of her analyses indicated that neither English nor mathematics teachers varied the sequence of instructional activities in response to differences in class achievement levels. However, in terms of time spent on various activities, there were significantly ($p < .10$) more transitions in higher ability classes. This appears to indicate that teachers do not change the activity focus as often for low-ability classes. By analyzing the same data, Sanford and Evertson (1983) looked for evidence of a relationship between the distribution of class time allocated to various instructional activities and students' rating of the teacher. Categories of class time use included whole class instruction, small group instruction, seatwork, dead time, transitions, grading, test-taking and non-academic time. No significant relationships were found between mean class time use for any of the categories and students' rating of the teacher.

Results of the Studies Examining Outcomes of the Science Teacher Education Programs at The Ohio State University

Several research studies have been conducted within the last 15 years to assess outcomes of the science teacher certification programs at The Ohio State University (OSU). These studies have focused primarily on the classroom performance and attitudes of the program graduates. The first of such studies was conducted by Sagness (1970). He compared the outcomes of the "project program", which emphasized involvement in schools of contrasting settings (urban and suburban) before student teaching with the "non-project" program, which provided few field experiences prior to student teaching. He measured pre-service teachers' views toward the type of activities which should be used in the science classroom in urban and suburban settings, the actual activities used during student teaching, and the pre-service teachers' attitude and knowledge of culturally deprived individuals.

Results of Sagness' study showed that project pre-service teachers held less restrictive views about the activities that should be used in an urban setting after the completion of the first professional quarter but held more restrictive views after the student teaching experience. Project pre-service teachers also used fewer inquiry activities during student teaching than did non-project individuals. In addition, project pre-service teachers had a greater knowledge of culturally deprived individuals but held less positive attitudes toward them than did the non-project group. Sagness also found that the most significant factor influencing the pre-service teacher's use of classroom activities was the cooperating teacher.

Brewington (1971) and Cignetti (1971) continued the work initiated by Sagness by following up on the graduates of the project and non-project programs during their first year of in-service teaching. Brewington compared project and non-project graduates with respect to their attitudes toward inquiry instruction and culturally deprived individuals. He also compared the two groups with respect to the types of activities they used in their classrooms. Cignetti compared The Ohio State University (OSU) graduates (project and non-project) to non-OSU graduates during their first year of teaching. Results of these two studies found that project graduates did not change their views regarding inquiry instruction over the year. However, the non-project graduates did change their views by the end of the year to believe that students should be less involved in inquiry activities. Project teachers also used more inquiry activities than non-project graduates and held more positive attitudes toward culturally deprived individuals. Non-OSU graduates and OSU graduates did not differ in the types of activities they felt should be used in the classroom nor in their use of such activities. However, OSU graduates did hold more positive views toward culturally deprived individuals than did non-OSU graduates.

Results of Brewington's study also found that the use of inquiry-oriented activities was strongly influenced by the availability of proper facilities and equipment.

A study a year later by Brown (1972) was similar to the one conducted by Sagness in that it looked at changes in views toward inquiry activities and use of such activities during student teaching by project and non-project pre-service teachers. He extended the work of Sagness by examining the influence of the personal characteristics of the pre-service teachers. Brown found that project teachers changed their views (more inquiry-oriented) toward the type of activities that should be used in the urban and suburban classroom after the first professional quarter. Brown also found that during student teaching project pre-service teachers used more inquiry activities than the non-project group. This finding was in contrast to Sagness's finding that project pre-service teachers used fewer inquiry activities during student teaching than were used by the non-project teachers. The difference in the findings of the two studies is apparently a result of program modifications that were made based upon outcomes of Sagness's study.

Brown found several variables that were significantly related to the use of inquiry. These variables were use of course content improvement project materials, the cooperating teacher's use of inquiry activities and attitudes of the pupils toward their class and teacher.

Swami (1975) conducted a follow-up study on graduates from the project, non-project and Post-Degree programs from one to five years after receiving teaching certification from OSU. Analysis of his data indicated there were no significant differences in the views toward inquiry activities and actual use of such activities between graduates with one to five years of teaching experience.

Swami identified a number of teacher, student and administrator variables which were related to the graduates' views toward, and actual implementation of, inquiry activities. Teacher-related variables included attendance at workshops designed to promote inquiry-oriented curriculum materials, adequacy of classroom facilities and equipment, diversity in use of instructional materials, teacher-student relationships, teacher's personal adjustment and gender. Student-related variables included liking of the science course, grade in science and attitude toward assignments. Administrator variables included administrator's views toward dealing with students, views toward diversity in instructional techniques, as well as type of encouragement given to teachers. The amount of variance that these factors accounted for ranged from 3 to 43 percent.

Summary

Numerous factors influence the instructional process occurring in the classroom. Certain of these factors have been identified by the studies conducted at The Ohio State University and elsewhere, and are reviewed in this section. One of these factors is related to the characteristics of the classroom teacher. These charteristics include both the personal and professional background of the teacher. A second factor is related to the school environment and includes the demographics of the school, characteristics of the students, administrative support, as well as the level of educational resources provided by the school system. A third factor which has been found to influence instruction is related to classroom management. There is some evidence to suggest that both a teacher's management skill and management style have an impact upon the instructional process but such evidence is not abundant. Empirical data examining the relationship between these variables would serve to shed further light on the impact that management success has on classroom instruction.

CHAPTER III

METHODOLOGY

This chapter describes details on the study sample, data collection procedures, comparisons made between Undergraduate and Post-Degree graduates participating in the study, the instruments and questionnaires used, a discussion on the variables, as well as the data analysis. Sections dealing with each of these areas are presented below.

Population and Sample

The population used for this study consisted of full-time in-service science teachers teaching in the United States during the 1985-86 school year who received teacher certification through The Ohio State University's science education programs between Spring Quarter, 1980 and Summer Quarter, 1985. This population was divided into two subpopulations; one consisting of individuals who completed the Undergraduate (UG) Program and one consisting of individuals who completed the Post-Degree (PD) Program.

Individuals to participate in this study were identified through the graduation and certification records in the College of Education's Student Development Office. Addresses of these individuals were obtained through the Office of Career Services. One hundred and twenty-six program graduates were identified by this process. By December 20, 1985 letters, each with a self-addressed return envelope, were mailed to 116 graduates asking them to provide information on their current employment status (Appendix B). Letters were not sent to 10 of the graduates because current addresses for these individuals were unavailable.

Results of the letter contacts are shown in Table 1, page 57. Responses were received from 99 graduates (48 Undergraduate and 51 Post-Degree) and represents an 85 percent response rate. Of the 17 graduates who did not respond to the request for information on their employment status, 13 were from the Undergraduate Program and four were from the Post-Degree Program. Nine of the non-respondents never received the letter requesting employment information because these letters were returned to the investigator by the U.S. Post Office for lack of a known address.

Data from Table 1 show that 53 (54 percent) of those who responded indicated they were teaching science in the United States (24 Undergraduate and 29 Post-Degree), 42 (42 percent) were not teaching, three (three percent) were teaching out of the science content field, and one (one percent) was teaching science outside of the United States.

A comparison of graduates from the two programs found 27 of 48 (56 percent) Undergraduate Program graduates contacted were currently teaching compared to 30 of 51 (59 percent) for the Post-Degree Program Graduates.

Table 1

Teaching Status of Individuals Graduating from OSU's Science Education Programs Since Summer 1980

STATUS	PROGRAM Undergraduate	 Post Degree
Individuals Located with Current Addresses Through College Records	61	55
Non-respondents	13	4
Respondents	48	51
Not Teaching	21	21
Teaching Outside United States	1	0
Teaching Outside the Science Content Field	2	1
Teaching in United States	23*	30**

* Of these 23 individuals, 21 participated in the study
** Of these 30 individuals, all participated in the study

Data on the cumulative grade point average (GPA) were collected for all program graduates initially identified through the College of Education's records, regardless of employment status. The cumulative GPA was compared between graduates teaching, not teaching and for which no employment information was obtained.

Means, standard deviations and sample sizes for the three groups are shown in Table 2, page 59. The mean cumulative GPA for graduates currently teaching was 3.22 (N=57). Similarily, the mean cumulative GPA for graduates not teaching was 3.23 (N=42). For the graduates for which no data on employment status were obtainable, the mean cumulative GPA was 3.07 (N=27). To determine if there were significant differences between the three groups with respect to this variable, a one-way analysis of variance (ANOVA) was performed. Results of this analysis, reported in Table 3 (page 59), showed no significant difference in the mean cumulative GPA between the three groups.

Data Collection Procedure

Follow-up telephone calls were made to all graduates who indicated they were currently employed as science teachers in the United States (N=53) to secure their willingness to participate in the study. Contacts were made with 51 of the 53 individuals and all of those contacted agreed to participate in the study. Two of the 53 individuals had unlisted telephone numbers. A letter was sent to them explaining the purpose of the study and asking them to indicate their

Table 2

Mean Grade Point Averages For Program Graduates By Teaching Status

Teaching		Not Teaching		No Employment Data	
X̄	S.D.	X̄	S.D.	X̄	S.D.
3.22	0.434	3.23	0.393	3.07	0.277
N=57		N=42		N=27	

Table 3

Analysis Of Variance Of Cumulative GPA By Teaching Status

Source	df	SS	MS	F	Sig
Between Groups	2	0.5232	0.2616	1.70	.19
Within Groups	123	18.9117	0.1538		
Total	125	19.4349			

willingness to participate by returning a postcard. No response was received from either individual so both were excluded from further participation.

By early March a letter was sent to the administrators of those graduates who agreed to participate in the study (Appendix B). The letter explained the purpose of the study and requested their cooperation in completing the Administrator Questionnaire which was also enclosed (Appendix D). At the end of the March, follow-up telephone calls were made to those administrators who had not return the questionnaire. Several of them indicated they had lost the questionnaire and asked that a second one be mailed. Others preferred to respond to the questions over the telephone. By mid-April responses were obtained from all 51 of the administrators.

At the same time the letter was sent to the administrators, a second telephone contact was made with the program graduates participating in the study to make arrangements for delivery and return of the packets of instruments. For the graduates living outside of Ohio, distribution and collection was handled through the U.S. mail. For those graduates living within Ohio, the majority of the packets were hand delivered. The remainder were mailed. All but three of the completed packets from graduates teaching within Ohio were picked up in person by the investigator. All materials were returned by mid-April. Data were obtained for all 51 (21 Undergraduates and 30 Post-Degree) of the individuals who agreed to participate.

The packet of instruments included one set of teacher materials and sets of student materials sufficient in number to distribute to each member of the class being used in the study. The teacher materials consisted of an instruction sheet outlining procedures for administering the student instruments, the Teacher Questionnaire and the Science Classroom Activity Checklist: Teacher Perceptions. Each set of student materials consisted of the Student Questionnaire, the Checklist for Assessment of Science Teachers: Pupil Perceptions and the Student Classroom Rating. Copies of these materials are found in Appendix C and D.

The decision as to which class to use was made by each teacher. They were asked to select the class they felt most comfortable using.

Comparisons Between Undergraduate and Post-Degree Graduates Participating in the Study

Year Certification Received

Data were collected from a total of 51 graduates. Twenty-one graduated from the Undergraduate Program and 30 from the Post-Degree Program. Table 4, page 62, presents a breakdown of these participants by the quarter that certification was received. The number of participants who received certification from Autumn (Au), 1984 through Summer (Su), 1985 was 13. Four of these participants received certification through the Undergraduate Program and nine received certification through the Post-Degree Program. The numbers of participants receiving certification from Au '83 through Su '84,

Table 4

Number of Graduates from the Undergraduate and Post-Degree Programs Teaching During 1985-86 by Quarter They Received Certification

Quarter Received Certification	Program Undergraduate	Post-Degree	Combined
Au '84-Su '85	4	9	13
Au '83-Su '84	3	7	10
Au '82-Su '83	3	7	10
Au '81-Su '82	5	1	6
Au '80-Su '81	2	3	5
Sp '80-Su '80	5	2	7
	N=21	N=30	N=51

Table 5

Gender Distribution of Study Participants

	Program Undergraduate Freq.	(%)	Post-Degree Freq.	(%)	Combined Freq.	(%)
Gender						
Male	10	(48)	14	(47)	24	(47)
Female	11	(52)	16	(53)	27	(53)
	N=21		N=30		N=51	

Au '82 through Su '83, Au '81 through Su '82, Au '80 through Su '81, and Sp '80 through Su '80 were: 10, 10, 6, 5, and 7, respectively. A breakdown by certification program for these participants is found in Table 4.

Gender and Age

Descriptive data on the gender and age of the participants are shown in Table 5 (page 62) and Table 6 (page 64), respectively. Of the 51 participants, 24 (47 percent) were males and 27 (53 percent) were females (Table 5). Twenty-one of the participants were Undergraduate Program graduates and of this number, 10 (48 percent) were males and 11 (52 percent) were female. Among the 30 graduates of the Post-Degree Program 14 (47 percent) were males and 16 (53 percent) were females.

The age in years of the graduates participating in the study ranged from 23 to 52. Frequencies of the various age categories and mean age are presented in Table 6. The greatest percentage of graduates from both the Undergraduate and the Post-Degree Programs were between 26 and 28 years of age. The Undergraduate Program had one participant over the age of 35 (age 37) while the Post-Degree Program had two participants (age 36 and 52).

The mean age for graduates of the Undergraduate and Post-Degree Program was 27.4 years and 28.1 years, respectively. Results of a t-test revealed no significant difference between the two groups with respect to this variable ($t_{49} = 0.60$, $p = .62$, n.s.).

Table 6

Age of Study Participants

	Program Undergraduate N=21		Post-Degree N=30		Combined N=51	
Age In Years	Freq.	(%)	Freq.	(%)	Freq.	(%)
23-25 years	5	(24)	9	(30)	14	(27)
26-28 years	12	(57)	12	(40)	24	(47)
29-31 years	2	(9)	4	(13)	6	(12)
32-35 years	1	(5)	3	(10)	4	(8)
Over 35 years	1	(5)	2	(7)	3	(6)
Mean Age in Years	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
	27.4	3.01	28.1	5.57	27.8	4.69

Subjects Taught, Number of Preparations and Class Size

Graduates participating in this study were asked during telephone or personal contact to indicate the subject area in which most of their teaching occurred. The frequency and percent of participating graduates teaching in these subjects are shown in Table 7, page 66. Biology and chemistry were the most frequently cited subjects taught by graduates of both programs combined. Each of these two areas was cited by 16 (31 percent) of the combined graduates. Earth science was the least frequently cited subject. Three (6 percent) of the graduates indicated they taught primarily in this area.

The most frequently cited subject area taught for graduates of the Undergraduate Program was chemistry. It was cited by 7 of 21 (33 percent) of these graduates and compares to 9 of 30 (30 percent) for the Post-Degree graduates. Among the Post-Degree graduates, biology was the most frequently cited subject. Twelve of 30 (40 percent) of the Post-Degree graduates taught primarily in this area. This compares to 4 of 21 (19 percent) for Undergraduates Program graduates.

Concerning number of class preparations, nine of the participating graduates (3 Undergraduate, 6 Post-Degree) reported having only one class preparation per day. Twenty-four graduates (11 Undergraduate, 13 Post-Degree) reported having two preparations, 16 (7 Undergraduate, 9 Post-Degree) reporting having three preparations and two graduates, both Post-Degree, reported having four preparations.

Table 7

Frequency and Percent of Study Participants Teaching In Various Subject Areas

Subject Taught	Program Undergraduate Freq.	 (%)	 Post-Degree Freq.	 (%)	 Combined Freq.	 (%)
Biology	4	(19)	12	(40)	16	(31)
Chemistry	7	(33)	9	(30)	16	(31)
Physics	1	(5)	4	(13)	5	(10)
Earth Science	3	(14)	0	(10)	3	(6)
General Science	6	(29)	5	(17)	11	(22)
	N=21		N=30		N=51	

Data on the mean number of preparations (subjects taught) per day are presented in Table 8. The mean number of preparations per day was 2.19 for the graduates of the Undergraduate Program and 2.27 for Post-Degree graduates. For both groups combined the mean was 2.23.

The size of the class used in the study ranged from 15 to 34 students. Three teachers (2 Undergraduate, 1 Post-Degree) indicated they had 15 or fewer students while three other teachers (all Undergraduates) indicated having 31 or more. The most frequently cited class size was 22 to 24 students. The mean class size for Undergraduate Program graduates was 23.0 students (Table 8). This compares to 22.3 for graduates of the Post-Degree Program. The mean class size for both groups combined was 22.5 students.

Table 8

Mean Number of Preparations Per Day and Class Size For Study Participants

	Program					
	Undergraduate		Post-Degree		Combined	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
Number of Preparations Per Day	2.19	0.679	2.27	0.944	2.23	0.838
Class Size	23.0	4.29	22.3	3.83	22.5	4.02
	N = 21		N = 30		N = 51	

Membership in Professional Organizations

Information on the types of professional organizations to which the participating graduates belonged was collected from the Teacher Questionnaire. These organizations were broken down into two categories. One category consisted of professional education organizations which included the National Education Association, state education associations and local education associations. The other category consisted of professional science/science education organizations. This latter category included the American Biology Teachers Association, National Science Teacher's Association, National Association of Geology Teachers, Science Education Council of Ohio, American Chemical Society and the Ohio Academy of Science.

Table 9, page 69, presents the data on the number and percent of participating program graduates who indicated they belonged to professional organizations. Fourteen (66 percent) of the graduates of the Undergraduate Program indicated they belonged to at least one professional education organization. This compares to 13 (43 percent) Post-Degree graduates. Membership in one or more professional science or science education organizations was indicated by 12 (57 percent) of the graduates of the Undergraduate Program and 21 (70 percent) of the Post-Degree graduates.

Instruments and Questionnaires

Below is a brief description of the instruments and questionnaires that were used in this study. Copies of each of these

Table 9

Frequency and Percent of Program Graduates Indicating Membership in Professional Organizations

Membership	Program Undergraduate Freq.	 %	 Post-Degree Freq.	 %	 Combined Freq.	 %
Professional Science/Science Education Organizations	12	(57)	21	(70)	33	(65)
Professional Education Organizations	14	(66)	13	(43)	17	(33)
	N = 21		N = 30		N = 51	

are located in Appendix C and D.

Science Classroom Activities Checklist: Teacher Perceptions (SCACL:TP)

The SCACL:TP, developed by Sagness (1970), was designed to assess teachers' perception and use of inquiry-oriented classroom activities. It was developed by modifying an earlier instrument, the Biology Classroom Activity Checklist (BCAC), which had been developed by Kochendorfer (1966) for the purpose of measuring the degree to which classroom practices promoted the objectives of the Biological Curriculum Study materials. Sagness modified the BCAC to produce an instrument that was applicable regardless of the science discipline. Two forms of Sagness's instrument were developed. One form, the Science Classroom Activities Checklist: Teacher's Perception (SCACL:TP), was designed to be completed by the teacher to measure his/her perception of the appropriateness of using inquiry-oriented activities. The other form, the Science Classroom Activities Checklist: Student's Perception (SCACL:SP), was designed to be completed by students to assess the degree to which a teacher uses these activities.

The SCACL:TP is a 60-item true or false questionnaire which contains seven subscales. The subscales are A. Student Classroom Participation (questions 1 through 8), B. Role of the Teacher in the Classroom (questions 9 through 17), C. Use of Textbook and Reference Materials (questions 18 through 25), D. Design and Use of Tests (questions 26 through 36), E. Laboratory Preparation (questions 37 through 44), F. Type of Laboratory Activities (questions 45 through 53), and G. Laboratory Follow-Up (questions 54 through 60). Possible scores on the SCACL:TP range from 0 to 60 with a high score reflecting a more positive attitude toward inquiry. An answer key indicating the most desirable responses is found in Appendix C.

Sagness established content validity by having several faculty members in science education at The Ohio State University respond to each item in a way such that their answers would reflect the practices they felt would positively contribute to inquiry-oriented instruction. Their responses were in 100 percent agreement with each other.

Reliability estimates of the SCACL:TP which have been reported in previous studies are shown in Table 10, page 74. Sagness reported KR-20 and KR-21 reliability estimates of .84 and .81, respectively, using 38 pre-service science teachers student teaching in urban and suburban settings. Brewington (1971) and Cignetti (1971) used the SCACL:TP to assess the views toward inquiry of first year graduates of Ohio State (OSU) and non-Ohio State graduates. Using 26 OSU graduates, Brewington found a KR-20 of .73. Cignetti reported KR-20 and KR-21 of .65 and .64 respectively, for OSU and non-OSU teachers combined. Swami (1975) reported a KR-20 of .71 and KR-21 of .66 using 88 in-service science teachers who had received certification from OSU. When using 51 in-service program graduates in this study, a KR-20 of .76 was obtained.

The version of the SCACL:TP used in this study was the one used by Swami (1975) except gender used on the instrument was changed. The

SCACL:TP, used by Swami, was written in the masculine gender when referring to the classroom teacher. For use in this study, the statements using the masculine gender were changed to represent both masculine and feminine gender. Modifications involved changing terms such as "he" to "he/she".

Checklist for the Assessment of Science Teachers: Pupil Perception (CAST:PP)

This instrument was developed by Brown (1972) to assess student-teacher relations and types of classroom activities used by the teacher. It was designed to be completed by students. The instrument consists of two subscales. One subscale, which measures the student-teacher relationship, was developed by Williamson (1956) from earlier work of Leeds and Cook (1947). It measures areas relating to the teacher's disciplinary style, student/subject matter viewpoint, attitudes toward adolescents, ability to understand adolescents with problems and the students' attitude toward the teacher. The first five questions of the CAST:PP make up this subscale. The second subscale, consisting of questions 6 through 10, measures students' perception of the degree to which the teacher uses instructional practices which promote inquiry. Brown developed this subscale by modifying the SCACL:SP.

The CAST:PP consists of 10 multiple choice statements. Each statement, which deals with some aspect of the teacher's behavior, has five possible responses ranging from "a" through "e". The response "a", the most desirable response reflecting a positive student-teacher relationship and greater use of inquiry activities, is given a value of 5, A response of "e", the least desirable response is given a value of 1. The lowest obtainable score on the CAST:PP is a 10 and the highest is a 50.

Brown (1972) and Swami (1975) reported reliability estimates of the CAST:PP (Table 11, page 74). The KR-20 and KR-21 were found to be .74 and .71, respectively, when Brown administered the instrument to 327 high school students. Swami reported a Hoyt reliability estimate of .77 as a result of administering the instrument to 994 students. Cronbach's Alpha was calculated to measure the internal consistency reliability as a part of this study. Using 1017 student responses, a Cronbach's alpha of .75 was obtained.

The procedure used to modify gender on the SCACL:TP to represent both masculine and feminine categories was also used to modify the CAST:PP for use in this study.

Student Classroom Rating (SCR)

The Student Classroom Rating (SCR) is a ten item instrument designed to measure the classroom management practices used by a teacher, as perceived by students. Six of the items were taken and modified from a portion of the Observer Rating of Teacher (ORT) which deals with classroom management practices. The ORT is an instrument which was developed for use in The Junior High Classroom Organization Study (JHCOS) at the University of Texas at Austin (Evertson, Emmer, and Clements, 1980). The remaining items were developed by the investigator and were based upon results of previous investigations

Table 10

Reliability Estimates of the SCACL:TP

Investigator	Sample	N	Measure	Value
Sagness	Preservice Teachers	38	KR-20 KR-21	.84 .81
Brewington	OSU Graduates	26	KR-20	.73
Cignetti	OSU and Non-OSU Graduates	45	KR-20 KR-21	.65 .64
Swami	OSU Graduates	88	KR-20 KR-21	.70 .65

Table 11

Reliability Estimates of the CAST:PP

Investigator	Sample	N	Measure	Value
Brown	High School Students	327	KR-20 KR-21	.74 .71
Swami	High School Students	994	Hoyt Reliability	.77

which identified effective classroom management practices used by science teachers (Sanford, 1984; and Tobin, 1984).

After initial development, the SCR was administered to two classes of tenth and eleventh grade students. A total of 37 students completed the instrument. Ten days later the instrument was readministered. Analysis of the responses during this pilot testing resulted in the deletion of 2 of the 12 items. This was due to the large variances and low test-retest correlations of these items. The remaining 10 items were analyzed to determine the internal consistency and test-retest reliability. Cronbach's Alpha was calculated to measure internal consistency. During piloting a Cronbach's Alpha of .80 for the ten items on the instrument was obtained when responses from the 37 students were analyzed. Later, when the instrument was administered to 1017 students as a part of the study, a Cronbach's alpha of .74 was obtained.

During piloting, a Pearson's r was calculated for each of the 10 items to determine the correlation between the responses to the item from the first to second administration of the instrument. A mean correlation coefficient for the 10 item-to-item correlations was also calculated. This was done to estimate test-retest reliability. Correlation coefficients for the ten items ranged from .0.64 to 1.00 (Table 12, pages 76-77). All of the correlation coefficients were significant at less than the .001 probability level. The average correlation coefficient for all of the items was 0.80.

Content validity of the SCR was established by asking five school administrators to examine the items on the instrument and indicate

Table 12

Test-retest Correlation Coefficients for the Items Comprising the SCR (N=37)

Item Number	Item	Pearson's r	*P*
1	Does your teacher give clear directions and assignments?	0.80	<.001
2	How often does your teacher allow an activity to continue too long, until students begin to get restless and no longer pay attention?	0.68	<.001
3	How obedient are the students in your classroom?	0.68	<.001
4	How often does your teacher have materials for laboratories available and ready when the lab begins?	0.70	<.001
5	When working in small groups, such as in lab, does your teacher check to see how your work is coming along?	0.88	<.001
6	Does your teacher enforce rules about acceptable student behavior?	0.83	<.001
7	What is the usual length of time between the time the bell rings and when your teacher begins an activity?	0.90	<.001

Table 12 (continued)

Test-retest Correlation Coefficients for the Items Comprising the SCR
(N=37)

Item Number	Item	Pearson's r	P
8	At what point in time in a typical class period does your class begin to lose its attention or concentration?	0.75	<.001
9	How successful is your teacher in getting students' attention by using a signal such as clapping hands or verbally asking for students' attention?	0.85	<.001
10	How often does your teacher let the class get out of hand to a point where most of the students are not doing what they are supposed to be doing?	1.00	<.001

whether or not they felt each item measured the management area it was intended to measure. All agreed that each item did relate to its management area. Below are the ten management areas represented by the items on the questionnaire:

1. Clarity in stating directions, assignments
2. Appropriate pacing of activities
3. Stopping of inappropriate behavior
4. Materials prepared
5. Monitoring of student work
6. Consistency in responding to student misbehavior
7. Efficient opening of class routines
8. Awareness of student behavior
9. Consistency of success in attention-getting
10. Ability to keep class on task

Each statement on the SCR has four possible responses ranging from "a" through "d". For statements 1 through 9, a "d" response is most desirable and indicates the highest rating for the use of effective classroom management practices. An "a" response is least desirable. For statement 10, an "a" response is most desirable and "d" least desirable. In this study each response was assigned a numerical value. The most desirable response was assigned a value of four and the least desirable a value of one. The highest possible score on the SCR was a 40 and indicated the highest rating for the use of effective classroom management practices. The lowest obtainable score was a 10.

Student Questionnaire

Items on the Student Questionnaire were designed to assess students' achievement and attitude toward science class. Four of the items were modified from the Student Rating of Teacher, an instrument used in the Junior High Classroom Organization Study (Evertson, Emmer and Clements, 1980). The remaining items were developed by the investigator.

The Student Questionnaire was given to a group of six 8th grade students for field testing. They were asked to read each question and tell the investigator what information they perceived the questionnaire was asking of them. Input from these students was used to modify one of the statements.

Teacher Questionnaire

The Teacher Questionnaire was developed by the investigator to collect data related to program graduates' professional development since receiving initial certification, the type of support they receive and the type of support they perceive is essential for science instruction, as well as information concerning the class they used for the study. Two items used to assess graduates' professional development were taken from a questionnaire developed by Brewington (1971) and Cignetti (1971). Items concerning the class used in the study, items dealing with the support teachers perceived were necessary but lacking for effective science instruction, as well as additional items related to the professional development of the graduates were developed by the investigator. Items related to administrative support were taken from a questionnaire developed and used by Swami (1975). These items were designed to assess the type of instructional leadership and discipline assistance program graduates feel they receive and perceive they should receive from their administrator. The Pupil Control Ideology (Willower et. al., 1967) instrument was integrated into this questionnaire to assess teachers' views toward humanistic and custodial control of students. The higher the score, the more custodial approach a teacher has toward controlling students.

The Teacher Questionnaire was piloted by asking five in-service science teachers to complete the questionnaire in the presence of the investigator. Each individual was asked to provide feedback on the clarity of each item. As a result, wording of four of the items was changed. All five individuals completed the questionnaire in less than 15 minutes.

Administrator Questionnaire

The Administrator Questionnaire was developed to assess variables related to the school and community, variables the administrator feels is appropriate for his/her instructional role as well as his/her views toward appropriate goals, curricula, and methods for science instruction. The items related to the administrator's instructional role were taken from Swami's (1975) Administrator Questionnaire. The PCI was integrated into the questionnaire to assess the administrator's pupil control ideology. The remaining items were developed by the investigator.

The Administrator Questionnaire was piloted with five school administrators in a manner similar to the method used to pilot the Teacher Questionnaire. This feedback was used to change the wording and answer format of three items. During piloting the questionnaire was completed by all respondents within ten minutes.

The Variables

The variables and their response codings are found in Appendix F. Means, standard deviations and sample sizes for all variables are found in Appendix G.

Frequency distribution of responses for all variables were examined in order to identify variables with skewed distribution. Skewed distribution for variables with dichotomous responses was considered to exist if one of the two response choices had a frequency of less than 10 (out of a possible 51). Skewed distribution for variables with more than two possible responses was considered to exist on a case by case basis. Variables with skewed distributions were removed from further analysis to avoid misinterpretation of results. Twenty-six of the 123 variables were removed. A listing of these variables is found in Table 13, pages 82-85.

Data Analysis

After collection, the data were coded for computer analysis. Statistical Package for the Social Sciences (SPSSX) subprograms were

Table 13

Variables Removed Due To Skewed Distribution

Variable Number	Symbol	Variable
5	MA	College Degree Level: MS/MA
6	MAHR	College Degree Level: MS/MA + hours
18	MEET2	Professional meetings annually attend: Two or More
27	PHY	Subject of class: Physics
29	EARTH	Subject of class: Earth Science
31	MOD	Type of class: Modified
50	TQ50	Teacher uses textbook with little modification.
52	TQ52	Teacher uses several textbooks.
53	TQ53	Teacher uses teacher developed materials.
54	TQ54	Teacher prefers to use textbook with little modification.
57	TQ57	Teacher prefers to use teacher developed materials.

Table 13 (continued)

Variables Removed Due To Skewed Distribution

Variable Number	Symbol	Variable
62	TQ62	Teacher perceives that the administrator should identify teacher's weaknesses and formulate plans for improvement with respect to helping the teacher use a variety of instructional techniques.
64	TQ64	Teacher perceives that the administrator does help the teacher identify weaknesses and work together to plan for improvement with respect to helping the teacher use a variety of instructional techniques.
68	TQ68	Teacher perceives that the administrator should identify the teacher's weaknesses and formulate plans for improvement with respect to the teacher's handling of discipline problems.
70	TQ70	Teacher perceives that the administrator does help the teacher identify weaknesses and work together to plan for improvement with respect to the teacher's handling of discipline problems.
71	TQ71	Teacher perceives that the administrator does identify the teacher's weaknesses and formulates plans for improvement with respect to the teacher's handling of discipline problems.

Table 13 (continued)

Variables Removed Due To Skewed Distribution

Variable Number	Symbol	Variable
74	INNER	Type of community served by school: Inner city.
82	AQ82	Administrator prefers teacher to use a textbook with little modification.
83	AQ83	Administrator prefers teacher to use a textbook with supplementary materials.
84	AQ84	Administrator prefers teacher to use several textbooks.
85	AQ85	Administrator prefers teacher to use teacher developed materials.
89	AQ89	Administrator feels that recognizing role of science as a part of education is the most important goal of science education.
90	AQ90	Administrator feels that developing skills in use of instruments and techniques is the most important goal of science education.

Table 13 (continued)

Variables Removed Due To Skewed Distribution

Variable Number	Symbol	Variable
94	AQ94	Administrator perceives encouragement he/she gives to the science teacher is to be free to do what teacher wants within legal boundaries.
95	AQ95	Administrator perceives that he/she should make the teacher be responsible, provide help when requested with respect to the teacher's handling discipline problems.
98	AQ98	Administrator perceives that he/she should make the teacher be responsible, provide help when requested with respect to helping the teacher use a variety of instructional techniques.

used for the analysis (SPSS Inc., 1986).

The statistical analysis procedures used in this study were as follows: 1) Hypotheses 1 through 3, which examined differences in teaching views and teaching practices between Undergraduate and Post-Degree Program graduates, were tested by performing univariate analysis of variance. 2) Hypothesis 4 which examined the relationship between instructional practices and classroom management practices was tested using Pearson product-moment correlation coefficient. 3) Hypotheses 5 through 7 which explored for relationships between the criterion variables and selected predictor variables were tested using stepwise multiple linear regression analysis.

The CAST:PP (subscale A and B) and the SCR were completed by students in order to assess teachers' behavior in the classroom. It was important to determine if there were identifiable student characteristics that might be biasing student ratings of these teachers. The first step was to compute correlation coefficients for student responses to subscale A and B of the CAST:PP and to the SCR with items on the student questionnaire. A correlation matrix showing correlation coefficients between these variables as well as all other variables is found in Appendix H. As a result of this analysis, it was found that the variable "Student's grade in this class" was significantly correlated ($p<.10$) to scores on subscale A ($r=0.22$, $p=.06$) and subscale B ($r=0.35$, $p=.01$) of the CAST:PP. It was not found to be significantly correlated to scores on the SCR ($r=0.04$, $p=.40$). These results indicated that students who received high grades in class perceived their teachers as being more positive in their student-teacher relations (subscale A, CAST:PP) and being more inquiry oriented in their teaching (subscale B, CAST:PP) than did students who received low grades.

In order to remove this biasing effect when the two groups of graduates (Undergraduate and Post-Degree) were compared on their scores on subscale B of the CAST:PP, the variable "Student's grade in this class" was used as a covariate. In order to adjust for the effect of students' grades during multiple regression analysis, an adjusted score for subscale A and B was calculated. Analysis was performed using adjusted scores and then again with unadjusted scores. This second analysis was done to determine what differences, if any, the adjustments made in the results.

The adjusted scores, adjusted for the relationship between the CAST:PP subscales and students' grades were computed as follows (Winer, 1971, page 754):

$$\bar{X}_{ad} = \bar{X}_{ob} - B\ (C_i - \bar{C})$$

where:

$\bar{X}ad$ = adjusted score
$\bar{X}_{ob}$ = observed score
B = raw score regression coefficient
C_i = observed value of covariate at X_{ob}
$\bar{C}$ = sample mean score of covariate

All hypotheses were stated in the null form. A hypothesis was rejected if it was significant at the .05 or .10 level. It was felt that using a significance level of .10 was acceptable since this study was exploratory in nature. In doing so, potential relationships would be identified and could aid future research.

CHAPTER IV

THE RESULTS

This chapter presents the results of the analysis of the data collected for this study. The results are organized into three sections. In the first section, differences between Undergraduate and Post-Degree Program graduates are examined. The two groups are compared on three criterion variables; attitudes toward the use of inquiry activities (hypothesis 1), use of inquiry activities in the classroom (hypothesis 2) and use of effective classroom management practices (hypothesis 3). Data for the comparisons were collected from responses on the _Science Classroom Activities Checklist: Teacher Perception_ (SCACL:TP), Subscale B of the _Checklist for the Assessment of Science Teachers: Pupil Perception_ (CAST:PP-B) and the _Student Classroom Rating_ (SCR). The first instrument was completed by the program graduate teachers. The latter two instruments were completed by students and class means for each teacher were used.

The second section deals with the testing for a relationship between classroom management practices and use of inquiry (hypothesis 4). Data for this aspect of the study came from the SCR and subscale B of the CAST:PP.

The third section presents results of analyses used to identify predictor variables for each of the three criterion variables. These were performed to look at the relative as well as cumulative effects of variables related to teachers' attitudes and practices (hypotheses 5, 6 and 7). The predictor, or independent, variables dealt with teacher characteristics and situational variables related to the students, class, school community and administration. Data for these independent variables were collected from the Teacher Questionnaire, Student Questionnaire and Administrator Questionnaire. Several of these variables were not used in the analysis due to skewed distribution of response frequencies. Chapter III, page 81, provides a discussion on the criteria that were used to remove these variables and a listing of those variables subsequently removed.

Each hypothesis was stated in the null form. An alpha level of .05 was used as the criterion for significance unless stated otherwise. A summary of the results is located at the end of each of the three sections.

Comparisons Between Undergraduate and Post-Degree Graduates

Hypotheses 1 through 3 tested for significant differences between the two groups with respect to the three criterion measures. Univariate F tests were used to test these hypotheses.

Test of Hypothesis 1

Hypothesis 1: Teacher graduates of the Undergraduate and Post-Degree Programs will not differ significantly in their views toward the appropriateness of instructional practices to be used in the science classroom.

Data to test Hypothesis 1 were collected by administering the SCACL:TP to all participating graduates. The SCACL:TP consists of seven subscales. The subscales are: A. Student Classroom Participation, B. Role of the Teacher in the Classroom, C. Use of Textbooks and Reference Materials, D. Type of Laboratory Activities, E. Laboratory Preparation, F. Type of Laboratory and G. Laboratory Follow-Up. A copy of the instrument and scoring key is found in Appendix C.

Comparisons between the two groups were made on the seven subscales as well as the composite score. Consequently, hypothesis 1 was tested for each of the subscales and the composite score.

Means and standard deviations for the subscales and composite scores are found in Table 14, page 91. Mean values for the Post-Degree graduates were higher than for the Undergraduates on six of seven subscales. Only on subscale A, Student Classroom Participation, did the Undergraduates have a higher mean than the Post-Degree graduates. Out of a total of eight points the mean response for the former group was 7.09 (SD=0.94). For the latter group a mean score of 6.86 (SD=1.19) was obtained. The greatest difference in subscale scores between the two groups occurred on subscale E, Laboratory Preparation. Out of a possible eight points, the mean was 5.76 (SD=1.17) for graduates of the Undergraduate Program and 6.30 (SD=1.08) for the Post-Degree Program graduates.

The mean SCACL:TP composite score was 49.95 (SD=5.25) for Undergraduate Program graduates and 51.23 (SD=4.70) for Post-Degree graduates. The composite score for both groups combined was 50.70

Table 14

Comparisons of Means and Standard Deviations of SCACL:TP Scores for Undergraduate and Post-Degree Graduates

		SCACL:TP Score							
Group	N	Subscale A (8)*	Subscale B (9)	Subscale C (8)	Subscale D (11)	Subscale E (8)	Subscale F (9)	Subscale G (7)	Composite (60)
Undergraduate	21								
M		7.09	8.19	6.76	9.33	5.76	7.14	5.67	49.95
S.D.		0.94	0.74	0.99	1.31	1.17	1.42	1.15	5.25
Post-Degree	30								
M		6.86	8.36	6.96	9.60	6.30	7.36	5.76	51.23
S.D.		1.19	0.76	1.13	1.03	1.08	1.30	1.01	4.70
Combined	51								
M		6.96	8.29	6.88	9.49	6.07	7.27	5.72	50.70
S.D.		1.09	0.76	1.07	1.15	1.15	1.34	1.05	4.92

*Value in ( ) indicates maximum score for each subscale and composite

(N=51, SD=4.92). This compares to 52.95 (N=86, SD=6.64) reported by Swami (1975) in a follow-up study of graduates after one to five years of in-service experience. Results of a t-test found significant differences between the mean scores for individuals participating in Swami's study and this study (t_{135}=2.10, $p < .05$).

In an earlier study, Brewington (1971) obtained SCACL:TP scores from first year in-service teachers graduated from the two science education programs at The Ohio State University, the "project" and "non-project" version. He reported a mean SCACL:TP composite scores of 52.0 (N=10, SD=4.71) for project program graduates and 52.0 (N=13, SD=6.32) for the non-project group.

Univariate F tests were used to determine if the Undergraduate and Post-Degree graduates differed significantly on the composite and subscale scores of the SCACL:TP. One of the assumptions of this test is homogeneity of variances over the composite and subscale scores. Bartlett-Box F tests were calculated to test for this assumption. The significance levels resulting from these tests indicated there was no reason to reject the hypothesis that the variances of the two groups are equal.

Results of the analysis are shown in Table 15, page 93. The univariate F tests comparing the two groups found no significant differences at the .05 or .10 level on the SCACL:TP composite score or on subscales A, B, C, D, F and G. However, on subscale E, Laboratory Preparation, a significant difference was found at the .10 level. Graduates of the Post-Degree Program had significantly higher mean scores on this subscale than did graduates of the Undergraduate

Table 15

Results of Univariate F-Tests Comparing SCACL:TP Scores Between Undergraduate and Post-Degree Graduates

	SCACL:TP							
Statistical Test	Subscale A	Subscale B	Subscale C	Subscale D	Subscale E	Subscale F	Subscale G	Composite
Homogeneity of Variance (Bartlett-Box-F)								
F (1,6576)	1.25	0.01	0.36	1.34	0.15	0.54	0.44	0.27
p	0.23	0.92	0.55	0.25	0.70	0.20	0.51	0.60
Univariate F test								
MS	0.64	0.38	0.52	0.88	3.58	0.62	0.12	20.26
F (1,49)	0.53	0.67	0.45	0.65	2.82	0.33	0.11	0.83
p	0.47	0.42	0.51	0.42	0.10	0.56	0.74	0.37

Program. This indicates the Post-Degree graduates are more inquiry oriented with respect to laboratory preparation than are graduates of the Undergraduate Program. Based upon these results, hypothesis 1 was rejected for subscale E. It was not rejected for subscales A, B, C, D, F, G and the composite score.

Test of Hypothesis 2

Hypothesis 2: Teacher graduates of the Undergraduate and Post-Degree Programs will not differ in the instructional practices they use in the classroom.

Data were collected from subscale B of the CAST:PP (CAST:PP-B) to determine the use of inquiry activities in the classroom. Each teacher selected a class to administer the instrument. A class mean for the subscale was computed for each teacher and used in the testing of this hypothesis.

Preliminary analysis of a correlation matrix of the student data found that a student's rating of a teacher on the CAST:PP-B was significantly correlated to the grade the student typically received in the class. To adjust for this relationship, "Student's grade in the class" (Variable 106, SQ2) was used as a covariate. In doing so, the influence of a student's grade on a teacher's CAST:PP-B rating was removed.

The maximum possible value on the CAST:PP-B is 25. The higher the score, the greater the use of inquiry activities in the classroom. The observed mean scores for the 51 participating graduates ranged from 14.30 to 21.42. Observed means and adjusted means for the two groups are found in Table 16, page 96. The observed mean score for both groups was 18.40 (SD = 1.68). Swami (1975) obtained CAST:PP-B scores from 86 in-service science teachers graduated from The Ohio State University. He reported a mean score of 17.96 (SD=2.07). Results of a t-test found no significant difference between mean CAST:PP-B scores for participants in Swami's study and this study ($t_{135}=1.29$, n.s. at .05 level).

A one-way analysis of covariance (ANCOVA) was performed to determine if significant differences between groups existed on the CAST:PP subscale B scores after making adjustments for student grades. ANCOVA assumes that the error variances of the two groups are equal. This assumption of homogeneity of variance was tested using Bartlett-Box F test. The results of this test indicated there was no evidence to suggest the assumption had been violated (F=.049, p=0.81, n.s.).

Table 17, page 96, presents the results of the analysis of covariance. The F statistic was found to be 2.42 with a probability level equal to 0.13. The means of the two groups did not differ significantly at the .05 level and therefore, it is not possible to conclude that graduates of the Undergraduate and Post-Degree Programs differ in their use of inquiry activities in the science classroom.

A one-way analysis of variance (ANOVA) was also performed to determine if significant differences between groups existed on unadjusted CAST:PP subscale B scores. Results of this test were the same as when "students' grades" was used as a covariate in that no significant differences were found between groups. Based upon these

Table 16

Comparison of Observed and Adjusted Means on the CAST:PP-B for Undergraduate and Post-Degree Graduates

	Program	
	Undergraduate	Post-Degree
Observed Mean	18.94	18.00
Adjusted Mean	18.82	18.11
N	21	30

Table 17

Analysis of Covariance of CAST:PP Subscale B Scores by Program

Source	df	SS	MS	F	*p*
Covariate	1	17.43	17.43	7.13	0.010
Adjusted Between Groups	1	5.93	5.93	2.42	0.126
Within Groups	48	117.40	2.45		
Total	50	140.76			

findings, hypothesis 2 was not rejected.

Test of Hypothesis 3

Hypothesis 3: Teacher graduates of the Undergraduate and Post-Degree Programs will not differ significantly in the classroom management practices they use in the science classroom.

The class mean for student responses to the Student Classroom Rating (SCR) was used as a measure of the management practices for each teacher. The maximum obtainable score on the SCR is a 40, indicating the highest rating for the use of effective classroom management practices. The class mean scores on this instrument for the 51 participating teachers ranged from 25.00 to 36.81 with a mean value of 31.05 (SD=2.54). For Undergraduates and Post-Degree graduates the means were 31.57 (SD=2.71) and 30.69 (SD=2.40), respectively (Table 18, page 98).

To determine if significant differences existed between the two groups of graduates on the mean SCR scores, a one-way analysis of variance was performed. An assumption of this test is homogeneity of variance. Results of Bartlett-Box F test indicated no reason to reject this assumption (F=0.345, p=0.56, n.s.).

Results of the analysis of variance are shown in Table 19, page 98. The F value was found to be 1.48 with a significance level equal to 0.23, thus indicating no significant difference in mean SCR composite scores for the two groups. Consequently, hypothesis 3 was not rejected.

Table 18

Mean Scores on the SCR for
Undergraduate and Post-Degree Graduates

	Program		
	Undergraduate	Post-Degree	Combined
Mean	31.57	30.69	31.05
S.D.	2.71	2.40	2.54
N	21	30	51

Table 19

Analysis of Variance of SCR Scores
by Program

Source	df	SS	MS	F	Sig.
Between Groups	1	9.5248	9.5248	1.48	0.23
Within Groups	49	314.4815	6.4180		
Total	50	324.0063			

Summary of Results for Hypotheses 1 through 3

Hypotheses 1 through 3 tested for significant differences between graduates of the Undergraduate and Post-Degree Programs with respect to three criterion measures; attitudes toward the appropriateness of inquiry activities, use of inquiry activities in the science classroom and use of effective classroom management practices.

Results of the analyses found the two groups differed significantly on one aspect of the first criterion measure. Post-Degree Program graduates scored significantly higher on subscale E of the SCACL:TP, Laboratory Preparation. This indicates that graduates of the Post-Degree Program hold more positive attitudes toward using inquiry-oriented laboratory preparation.

Results of the analyses also found that the two groups did not differ with respect to the latter two criterion measures, thus indicating graduates of the two programs are similar in their use of inquiry activities in the science classroom and in their use of effective classroom management practices.

Relationship Between Instructional and Classroom Management Practices

This section provides results of the testing of hypothesis 4 which examined the relationship between the use of effective classroom management practices and use of inquiry activities in the science classroom. A Pearson product moment correlation coefficient was used to test for a significant relationship between these two variables.

Test of Hypothesis 4

Hypothesis 4: There is no significant relationship between instructional practices and classroom management practices used by program graduate teachers in the science classroom.

Subscale B of the CAST:PP was used as a measure of the instructional practice used. The higher the score, the greater the use of inquiry activities in the classroom. The composite score on the SCR was used as a measure of classroom management practices. A higher score indicated the use of more effective management practices.

Class means for the two variables were calculated for each teacher and used in the analysis. Two correlation coefficients were computed. One was computed between the SCR and adjusted scores on subscale B of the CAST:PP. The adjusted scores, as mentioned in Chapter 3, were adjusted for the effect of students' grades. Another analysis involved unadjusted scores. This latter analysis was conducted to determine if there were differences in the results using adjusted and unadjusted subscale B CAST:PP scores.

Results of the analysis are shown in Table 20, page 101. The Pearson correlation coefficients between the SCR and the adjusted and unadjusted CAST:PP-B scores were 0.49 and 0.47, respectively. Both of these values were significant at less than the .001 level. The adjustment in subscale B CAST:PP scores did change the strength of the relationship between this variable and the SCR. Based upon these findings, hypothesis 4 was rejected.

Results indicate program graduate teachers rated high in their use of inquiry are more likely to be effective classroom managers.

Table 20

Pearson Correlation Coefficient Between the Composite SCR and Adjusted and Unadjusted Scores on Subscale B of the CAST:PP

	Subscale B - CAST:PP	
	Adjusted	Unadjusted
r	0.49	0.47
p	< 0.001	< 0.001

Indentification of Predictor Variables for the Criterion Variables

This section presents results of multiple regression analyses used to identify predictor variables for each of the three criterion measures. The criterion variables were the program graduate teachers' attitude toward the use of inquiry activities, use of inquiry activities in the classroom and classroom management practices. Data to assess the graduates' views toward inquiry came from the SCACL:TP. Data to assess the use of inquiry activites and classroom management practices came from subscale B of the CAST:PP and the SCR, respectively. Data on the independent variables which dealt with teacher characteristics and situational variables were collected from the Teacher Questionnaire, Student Questionnaire and Administrator Questionnaire.

Stepwise multiple regression analysis was used to test each hypothesis. An independent variable was considered to contribute to the prediction of a criterion variable if it accounted for at least four percent of the variance and had a partial F value significant at no greater than the .05 level. Discussion will be based upon those contributing variables.

Test of Hypothesis 5

Hypothesis 5: There is no significant relationship between selected program graduate teachers' characteristics or situational variables and their views toward the instructional practices to be used in the classroom.

Stepwise multiple regression was performed using the SCACL:TP composite score as the dependent (criterion) variable. Two sets of independent variables were used. One set included adjusted CAST:PP subscale scores among the independent variables. The second set included unadjusted CAST:PP subscale scores. This was done to determine what differences, if any, the adjustments made in the results. Neither the adjusted subscale A and B scores of the CAST:PP nor the unadjusted scores were found to be significant predictors of the SCACL:TP. Therefore, there were no differences in the predictor variables as a result of adjusting CAST:PP scores.

Table 21, page 103, presents the results of stepwise multiple regression analysis using the SCACL:TP composite score as the dependent variable. The strongest predictor of program graduate teachers' views toward the use of inquiry activities was variable 72

Table 21

Multiple Regression Analysis of SCACL:TP
Composite Score Excluding Subscales

Step No.		Variable Entered	Sign of Coefficient	Multiple R	Multiple R^2	Increase R^2	Partial F	$\underline{P}$
1	(72)	Teacher's Pupil Control Ideology	--	0.5440	0.2959	0.2959	18.92	$< .001$
2	(43)	Class Size Viewed As Not a Problem	+	0.6489	0.4211	0.1251	9.51	.003
3	(58)	Administrative Support for Discipline Problems	+	0.7258	0.5267	0.1056	9.60	.003
4	(106)	Student's Grade in This Class	+	0.7659	0.5866	0.0599	6.08	.018

(TPCI) "Teacher's pupil control ideology". This variable, which entered at step one, accounted for 30 percent of the variance. A negative relationship was found between this variable and views toward inquiry. Variable 43 (C43) "Class size viewed as no problem" entered the equation at step two and accounted for an additional 13 percent of the variance. Variable 58 (TQ58) "Administrative support for discipline problems" and Variable 106 (SQ2) "Student's grade in the class" accounted for an additional 11 percent and six percent of the variance, respectively. Based upon these findings, hypothesis 5 was rejected.

These results indicate that teachers' attitude toward controlling students and level of administrative support for discipline are important predictors of their attitude toward inquiry instruction. The less custodial a teacher's attitude toward pupil control and the higher the level of administrative support for discipline, the more positive the attitude toward inquiry.

Results of this study also indicate that class size is an important predictor of attitudes toward inquiry. Teachers who perceive class size is not a constraint to effective instruction are more likely to hold positive attitudes toward inquiry.

Test of Hypothesis 6

Hypothesis 6: There is no significant relationship between selected program graduate teachers' characteristics or situational variables and the instructional practices they use in the classroom.

Stepwise multiple regression analysis was performed using subscale B of the CAST:PP (adjusted) scores as the dependent (criterion) variable. Two separate analyses were performed. One analysis included subscale A of the CAST:PP (adjusted) scores among the independent variables. The second analysis excluded the subscale A scores. This was done to allow additional variables to enter into the regression equation.

In order to determine the effect of adjusted subscale scores of the CAST:PP, the analyses described above were rerun using unadjusted CAST:PP scores. Results from using the unadjusted scores are also reported.

Analyses including CAST:PP-A scores. Table 22, page 106, presents the results of stepwise regression analysis including subscale A (adjusted) of the CAST:PP, "Student-teacher relationship". This variable was the first to enter the equation and accounted for 31 percent of the variance. Entering at step number two was variable 47 (C47) "Discipline/control of students perceived as no problem". It accounted for an additional 14 percent of the variance. The step three variable, 66 (TQ66) "Teacher feels administrator should make the teacher responsible for discipline" accounted for an additional 12 percent of the variance and had a negative relationship with use of inquiry. Entering at step four was variable 97 (AQ 97) "Administrator feels he/she should be solely responsible for identifying teacher's weaknesses in discipline". It accounted for an additional six percent of the variance and was negatively related to the criterion variable.

Table 22

Multiple Regression Analysis of CAST:PP Subscale B Adjusted for Student Grades (Including CAST:PP Subscale A)

Step No.		Variable Entered	Sign of Coefficient	Multiple R	Multiple R^2	Increase R^2	Partial F	P
1	(113)	CAST:PP Subscale A Adjusted	+	0.5594	0.3129	0.3129	20.49	< .001
2	(47)	Discipline of Students Perceived As No Problem	+	0.6695	0.4483	0.1354	10.80	.002
3	(66)	Teacher Perceives Administration Should Make the Teacher be Responsible for Discipline	--	0.7529	0.5668	0.1185	11.77	.002
4	(97)	Administrator Feels He/She Should Be Solely Responsible for Identifying Teachers Weaknesses in Discipline	--	0.7916	0.6266	0.0608	6.85	.010

When this same analysis was conducted using unadjusted CAST:PP scores, the first two variables entering the equations and their order of entry were the same as when adjusted scores were used (Table 23, page 108). However, at the remaining steps, three new variables entered the equation. The first of these variables was Variable 16 (MEETO) "Do not attend professional meetings". The sign of the coefficient for this variable indicated a negative relationship between not attending professional meetings and use of inquiry. The second new variable was Variable 112 (SQ8) "Sex of student". A positive relationship was found between female students and use of inquiry. The third new variable, which had a positive relationship with use of inquiry, was Variable 99 (AQ99) "Administrator feels he/she should help the teacher identify instructional weaknesses and plan for improvement".

Analyses excluding CAST:PP-A scores. Results of multiple regression analysis when subscale A (adjusted) of the CAST:PP was excluded from the independent variables are shown in Table 24, page 109. When comparing this analysis to the analysis performed using subscale A (adjusted) of the CAST:PP among the independent variables (shown in Table 22, page 106), a major difference occurred at step one. At this step, subscale A (adjusted) of the CAST:PP was replaced by variable 116 (SCRALL) SCR composite score. At steps two and three the variables and their order of entry were the same as when subscale A (adjusted) of the CAST:PP was included. However, in the remaining steps new variables entered the equation. These were variable 112

Table 23

Multiple Regression Analysis of CAST:PP Subscale B
Unadjusted For Student Grades (Including CAST:PP Subscale A)

Step No.		Variable Entered	Sign of Coefficient	Multiple R	Multiple R^2	Increase R^2	Partial F	*P*
1	(113)	CAST:PP Subscale A	+	0.5769	0.3328	0.3328	22.45	< .001
2	(47)	Discipline of Students Perceived as No Problem	+	0.6875	0.4727	0.1398	11.66	.001
3	(16)	Teacher Attends No Professional Meetings	--	0.7424	0.5511	0.0784	7.52	.009
4	(112)	Student's Sex-Female	+	0.7923	0.6277	0.0765	8.64	.005
5	(99)	Administrator Feels Should Help Identify Weaknesses and Plan Improvement with Respect to Instruction	+	0.8259	0.6822	0.0549	7.03	.010

Table 24

Multiple Regression Analysis of CAST:PP Subscale B
Adjusted for Student Grades (Excluding CAST:PP Subscale A)

Step No.		Variable Entered	Sign of Coefficient	Multiple R	Multiple R^2	Increase R^2	Partial F	P
1	(116)	SCR Composite Score	+	0.4700	0.2210	0.2210	12.76	< .001
2	(47)	Discipline of Students Perceived As No Problem	+	0.5843	0.3414	0.1205	8.05	.007
3	(66)	Teacher Perceives Administration Should Make Teacher Be Responsible for Discipline	--	0.7046	0.4964	0.1550	13.23	< .001
4	(112)	Student's Sex-Female	+	0.7710	0.5945	0.0980	10.15	.003
5	(59)	Satisfaction with Instructional Support from Administration	+	0.8033	0.6453	0.0508	5.87	.020

(SQ8) "Student's sex" and variable 59 (TQ59) "Satisfaction with instructional support received from administrator".

The same analysis was conducted using unadjusted CAST:PP scores and resulted in three new variables entering the equation (Table 25, page 111). The most significant predictor of subscale B CAST:PP scores showing up in this analysis was variable 107 (SQ3) "Student's liking of this class". The other variables that were new to the equation were variable 99 (TQ99) "Administrator feels he/she should help the teacher identify weaknesses and plan for improvement" and variable 16 (MEETO) "Do not attend professional meetings". Based upon the findings, hypothesis 5 was rejected.

From the results using the adjusted CAST:PP scores, it appears that teachers who use inquiry-oriented instructional activities in the classroom tend to be rated high by their students in terms of their student-teacher relationship and classroom management skills. In addition, these teachers tend to feel that control of their students is not a constraint to effective instruction. They also feel they work with administrators who provide support for discipline and instruction.

When students' grades are not controlled for in the ratings of teachers on the CAST:PP, the strongest predictor of subscale B of the CAST:PP (excluding subscale A) is students' liking of the class (Table 25, page 111). When grades are controlled for, students' liking of the class does not significantly contribute to the predictor of subscale B CAST:PP scores. This indicates that students' grade in class is an important variable to control for when assessment of

Table 25

Multiple Regression Analysis of CAST:PP Subscale B Unadjusted for Student Grades (Excluding CAST:PP Subscale A)

Step No.		Variable Entered	Sign of Coefficient	Multiple R	Multiple R^2	Increase R^2	Partial F	*P*
1	(107)	Student Enjoys Class	+	0.5328	0.2839	0.2839	17.84	< .001
2	(47)	Discipline of Students Perceived as No Problem	+	0.6187	0.3828	0.0989	7.05	.011
3	(112)	Sex of Student-Female	+	0.6936	0.4812	0.0983	8.15	.006
4	(66)	Teacher Perceives Administrator Should Make Teacher Be Responsible for Discipline	--	0.7570	0.5731	0.0919	9.04	.004
5	(99)	Administrator Feels Should Help Identify Weaknesses and Plan Improvement with Respect to Instruction	+	0.7948	0.6317	0.0586	6.52	.014
6	(16)	Teacher Attends No Professional Meetings	--	0.8355	0.6981	0.0664	8.80	.005

teachers is made by students using the CAST:PP. It also indicates students' liking of the class is related to the grade they receive.

Test of Hypothesis 7

Hypothesis 7: There is no significant relationship between selected program graduate teachers' characteristics or situational variables and the classroom management practices they use in the classroom.

Stepwise multiple regression analysis was performed using the SCR composite as the dependent (criterion) variable. Two sets of independent variables were used. One set included adjusted CAST:PP subscale scores among the independent variables. The second set included unadjusted CAST:PP subscale scores. This was done to determine what differences, if any, the adjustments made in the results. Neither the adjusted subscale A and B scores of the CAST:PP nor the unadjusted scores were found to be significant predictors of the SCR. Therefore, there were no differences in the predictor variables as a result of adjusting CAST:PP scores.

Results of the analysis are presented in Table 26, page 113. The strongest predictor of the SCR composite score was variable 109 (SQ5) "Student's feeling of how much learned in class". It accounted for 60 percent of the variance. Two additional variables significantly added to the prediction of SCR composite scores. These were variable 26 (CHEM) "Subject of class: Chemistry", accounting for five percent of the variance and variable 67 (TQ67) "Teacher feels administrator should help in identifying weaknesses in discipline and plan for

Table 26

Multiple Regression Analysis of SCR Composite

Step No.		Variable Entered	Sign of Coefficient	Multiple R	Multiple R^2	Increase R^2	Partial F	P
1	(109)	Student's Feeling of How Much Learned in Class	+	0.7770	0.6037	0.6037	68.58	< .001
2	(26)	Subject of Class: Chemistry	+	0.8113	0.6583	0.0545	7.02	.011
3	(67)	Teacher Feels Administrator Should Help in Identifying Discipline Weaknesses and Plan Improvement	+	0.8336	0.6953	0.0371	5.23	.027

improvement" accounting for an additional four percent. As a result of these findings hypothesis 7 was rejected.

These results indicate students who rate their teachers high in terms of their classroom management skills also feel they have learned much from the class. The results also indicate that teachers in this study rated high in management skills are more likely to teach chemistry and feel their administrators assist them to identify weaknesses in their handling of discipline.

Summary of Results for Hypotheses 5 through 7

Hypotheses 5 through 7 tested for the presence of significant predictor variables for the three criterion measures; attitudes toward the use of inquiry activities, use of inquiry activities in the classroom and use of effective classroom management practices.

Attitudes toward inquiry. Results of multiple regression analysis using the SCACL:TP composite score as the dependent variable found teacher characteristics and situational variables to be significant predictors of attitudes toward inquiry activities. Teacher's pupil control ideology was found to be a strong predictor of these attitudes. The more humanistic the control orientation, the more positive were the attitudes toward inquiry.

Class size is a situational variable which was found to be associated with attitudes toward inquiry. Teachers who perceived class size was not a constraint to effective instruction were more likely to hold attitudes supportive of inquiry. Another situational variable found to be related to teachers' attitudes toward inquiry was administrative support. Positive attitudes were more likely to be held by teachers who feel they had sufficient administrative support for discipline problems.

Student grade received in the class was also found to be positively associated with teacher attitudes toward inquiry. This last variable is difficult to interpret. It may be possible that students with high grades represent a class of more highly motivated students. A high level of motivation and achievement may then impact upon a teacher's attitude toward the appropriateness of inquiry-oriented instructional activities.

Use of inquiry. The student-teacher relationship was found to be a strong predictor of the use of inquiry activities. When it was removed from the analysis, classroom management practices showed up as a strong predictor. To a lesser degree, teachers' perceptions of the level of discipline problems in the classroom and attitude toward the support for discipline and instruction received from the administration were found to be related to the use of inquiry activities.

The entrance of several student characteristics into the equation when unadjusted CAST:PP scores were used pointed out the importance of controlling for student grades when assessment of teachers are made on the CAST:PP.

Classroom management practices. Students' feeling of how much had been learned in the class was found to be the strongest predictor of teachers' use of effective classroom management practices. The subject taught and teachers' attitudes toward the appropriate administrative support for discipline were also found to be related to classroom management.

CHAPTER V

SUMMARY, DISCUSSION, AND RECOMMENDATIONS

This chapter is divided into three sections. The first section provides a summary of the study with respect to its purpose, methods and results. The second section focuses on a discussion of the findings and relates them to results of related research studies. The third and final section provides recommendations for the future.

Summary of the Study

The purpose of this study was to assess and compare selected instructional and classroom management practices of teachers who are graduates of the Undergraduate and Post-Degree Programs in secondary school science at The Ohio State University. Specifically, the two groups were compared with respect to their attitudes toward the use of inquiry activities, use of these activities in the classroom and the use of effective classroom management practices. This study also sought to identify teacher characteristics and contextual variables which were related to these attitudes and practices.

The sample used for this study was drawn from all full-time in-service science teachers (teaching in the United States) who received teacher certification through The Ohio State University science education programs between Spring Quarter, 1980, and Summer Quarter,

1985. Fifty-three individuals were identified and 51 of these participated in the study.

Three instruments were used to collect data for this study. *The Science Classroom Activities Checklist: Teacher Perception* (SCACL:TP) was completed by the teacher graduates to assess their attitudes toward inquiry activities. *The Checklist for the Assessment of Science Teachers: Pupil Perception* (CAST:PP) was completed by students in the teacher graduates' class to assess the student-teacher relationship and use of inquiry activities. The *Student Classroom Rating* (SCR) was also completed by students and assessed classroom management practices.

In addition to the instruments described above, questionnaires were developed and administered to the graduates as well as to their administrator/supervisor and students. These questionnaires were used to collect data on teacher characteristics and contextual variables relating to the students, class, school community and administration.

Analysis of variance and covariance as well as stepwise multiple regression analysis were used to test the seven hypotheses. The results of the analyses are presented for each hypothesis.

Hypothesis 1

Hypothesis 1: Teacher graduates of the Undergraduate and Post-Degree Program will not differ significantly in their views toward the appropriateness of instructional practices to be used in the science classroom.

This hypothesis tested for significant differences between the Undergraduate and Post-Degree teacher graduates with respect to their attitudes toward the use of inquiry activities. To determine if significant differences existed between the two groups, univariate F-tests were performed on the composite and subscales scores of the SCACL:TP. Results of the analysis found significant differences did exist between mean scores on subscale E, Laboratory Preparation, for the two groups at the .10 level. Graduates of the Post-Degree Program had significantly higher scores indicating these individuals held more positive attitudes toward this aspect of inquiry.

Based on these findings, hypothesis 1 was rejected for subscale E. It was not rejected for subscales A, B, C, D, F, G and the composite score.

Hypothesis 2

Hypothesis 2: Teacher graduates of the Undergraduate and Post-Degree Program will not differ in the instructional practices they use in the science classroom.

This hypothesis tested for significant differences between the two groups of graduates with respect to their use of inquiry activities in the classroom. Scores on subscale B of the CAST:PP were used to assess the use of inquiry activities. Analysis of covariance was performed on the scores from subscale B of the CAST:PP. Variable 106 (SQ2) "Student's grade in class" was used as the covariate. The analysis showed that no significant differences existed between mean scores (adjusted for students' grades) for the two groups of graduates at either the .05 or .10 level, thus indicating the two groups did not differ in their use of inquiry activities in the classroom.

Analysis of variance (ANOVA) using unadjusted scores was also performed to determine if the two groups differed on CAST:PP subscale B scores which were not adjusted for the influence of students' grades. Results of this analysis were the same as when CAST:PP subscale B scores were adjusted through ANCOVA. No significant differences were found between the two groups.

Based on these findings, hypothesis 2 was not rejected.

Hypothesis 3

Hypothesis 3: Teacher graduates of the Undergraduate and Post-Degree Program will not differ significantly in the classroom management practices they use in the science classroom.

This hypothesis tested for significant differences between the two groups of graduates with respect to their use of effective management practices. Analysis of variance was performed to compare the mean score on the SCR for the two groups. Results found no significant differences between the mean SCR scores for the two groups at the .05 or .10 level. This finding indicated graduates of the Undergraduate and Post-Degree programs did not differ in their use of effective management practices.

Based on these findings, hypothesis 3 was not rejected.

Hypothesis 4

Hypothesis 4: There is no significant relationship between instructional practices and classroom management practices used by program graduate teachers in the science classroom.

This hypothesis tested for a significant relationship between the use of inquiry activities and effective classroom management practices. Subscale B of the CAST:PP was used to measure the use of inquiry activities in the classroom and the SCR was used to measure the use of effective management practices. A Pearson product moment correlation coefficient was computed between scores on the CAST:PP subscale B, adjusted for the influence of students' grades, and the SCR. It was also computed between unadjusted CAST:PP scores and scores on the SCR. A significant correlation at the .001 level was found between the SCR and both the adjusted and unadjusted CAST:PP subscale B scores. Teachers who were found to use inquiry activities were more likely to be effective classroom managers than were teachers who did not use such activities.

Based on these findings, hypothesis 4 was rejected.

Hypothesis 5

Hypothesis 5: There is no significant relationship between selected program graduate teachers' characteristics or situational variables and their views toward the instructional practices which should be used in the science classroom.

This hypothesis was concerned with the identification of predictor variables for the dependent variable, attitude toward the use of inquiry activities. The composite score on the SCACL:TP was used to assess attitudes toward inquiry. The predictor variables dealt with teacher characteristics and situational variables related to the students, class, school community and administration. Data for these variables were collected from the Teacher Questionnaire, Student Questionnaire and Administrator Questionnaire.

Stepwise multiple regression analysis resulted in the identification of one teacher-related variable and three situational variables as significant predictors. The teacher-related variable was the teachers' pupil control ideology. Teachers who valued the use of inquiry activities in the science classroom were more likely to be humanistic in their pupil control ideology. The three situational variables which were found to be significant predictors were related to class size, administrative support for discipline and students' grades in class. Teachers who indicated the size of their class was not a constraint to effective instruction and had sufficient administrative support for discipline were found to hold more positive attitudes toward use of inquiry.

Based on these findings, hypothesis 5 was rejected.

Hypothesis 6

Hypothesis 6: There is no significant relationship between selected program graduate teachers' characteristics or situational variables and the instructional practices they use in the science

classroom.

This hypothesis was concerned with the identification of predictor variables for the dependent variable, use of inquiry activities. Subscale B of the CAST:PP, adjusted for the influence of students' grades, was used to assess teachers' use of inquiry activities in the classroom. Two separate regression analyses were performed, each using a different set of independent variables. One set included subscale A (adjusted) of the CAST:PP "The student-teacher relationship" while the other set excluded this variable. The two regression analyses just described were also performed using unadjusted CAST:PP scores to determine what difference, if any, the adjustments made in the results.

Four variables were found to be significant predictors based upon the results of multiple regression analysis including CAST:PP subscale A (adjusted) scores among the set of independent variables. These were: the student-teacher relationship, teacher's perception of the lack of discipline problems in the classrooms, the type of administrative support for discipline the teacher feels is appropriate and the administrator's perception of his/her role in identifying the teacher's weaknesses in handling discipline.

The same analysis was conducted without subscale A (adjusted) scores being included among the independent variables. Results of this analysis, as compared to when subscale A (adjusted) was included, found a new predictor variable, use of effective management practices, replacing the variable, the student-teacher relationship, as the strongest predictor of the use of inquiry. Two of the predictor variables were the same as when CAST:PP subscale A (adjusted) was included in the analysis. These were the teacher's perception of the lack of discipline problems and the type of administrative support for discipline that the teacher perceives is appropriate. The remaining two significant predictors were not found to be significant predictors when subscale A (adjusted) scores were included. These new variables were student's gender (favoring females) and the level of satisfaction with the instructional support received from the administration.

The two analyses described above using adjusted CAST:PP subscale A and B scores, one including subscale A and one excluding it from the set of independent variables, were also performed using unadjusted scores. When unadjusted CAST:PP subscale A scores were included among the set of independent variables, two of the significant predictors were found to be the same as when adjusted scores were used. These were the student-teacher relationship and the teacher's perception of the lack of discipline problems. The other variables found to be significant predictors in this analyis were not found to be significant predictors when CAST:PP adjusted scores were used. These were: the teacher's attendance at professional meetings, gender of students (favoring females) and the adminstrator's perception of the type of instructional support that should be provided.

When CAST:PP subscale A (unadjusted) scores were excluded from the set of independent variables and CAST:PP subscale B (unadjusted) was used as the criterion (dependent) variable, three of the significant predictors were the same as when adjusted CAST:PP subscale B scores were used. These variables were: the teacher's perception of the lack of discipline problems, the type of administrative support for discipline the teacher perceives is important and the gender of the students (favoring females). Two variables were new to the equation. These were: the student's liking of the class, the administrator's perception of the type of assistance for instruction that should be given to teachers and the teacher's attendance at professional meetings.

Based upon the results using adjusted scores, teachers rated high in their use of inquiry activities were more likely to be perceived by students as having positive student-teacher relationships and using effective classroom management practices. In addition, these teachers perceived that they had no discipline problems in their classroom and perceived that they worked with administrators who provided sufficient support for discipline and instruction.

Based on these findings, hypothesis 6 was rejected.

Hypothesis 7

Hypothesis 7: There is no significant relationship between selected program graduate teachers' characteristics or situational variables and the classroom management practices they use in the science classroom.

Hypothesis 7 was concerned with the identification of predictor variables for the dependent variable, use of effective management practices. The composite score on the SCR was used as a measure of effective management. The independent variables dealt with teacher characteristics and situational variables related to the students, class, school community and administration.

Results of stepwise multiple regression analysis found several variables to be significant predictors. These variables were: students' feeling of how much is learned in class, the science content area of the class and teachers' attitude toward the type of assistance administrators should provide for discipline.

Teachers rated high in their use of effective classroom management practices taught students who felt they learned a great deal in class, were more likely to teach chemistry and felt administrators should work with teachers with respect to handling discipline problems.

Based on these findings, hypothesis 7 was rejected.

Discussion

Program Comparisons

The results of this study indicate that graduates of the Post-Degree Program hold more positive attitudes toward the aspect of inquiry dealing with laboratory preparation than do graduates of the Undergraduate Program. In attempting to determine a reason for this finding, there is no indication from the data gathered that graduates from the two programs differ with respect to variables related to the settings in which they teach. It is not likely, therefore, that the differences in attitudes are due to different in-service experiences. It is possible that the differences are related to different experiences received during the two programs. They might also be related to differences in the science content background between individuals graduated from the two programs. Support for this latter idea comes from several studies in which the relationship between attitudes toward inquiry and background characteristics were examined. These studies have found secondary science teachers with more science content hours were found to react more favorably to inquiry instruction (Blankenship, 1964; Lararowitz et. al., 1978). Typically Post-Degree teachers have pursued a science content area in greater depth than have teachers from the Undergraduate Program. Whether or not they have taken a greater number of science content hours is not known as no data on the quantitative and qualitative differences in the science content backgrounds between the two groups were collected.

Findings from this study indicate that the teacher graduates from the Undergraduate and Post-Degree Programs are similar in their use of inquiry instruction. This finding is supported by results of Swami's (1975) follow-up study of graduates of the science education program at Ohio State. Although he used a limited sample of Post-Degree graduates, he reported no significant differences in the use of inquiry activities between science teachers prepared in the different versions of the science pre-service program.

It is interesting to note that the graduates of the Undergraduate and Post-Degree Programs differed with respect to their attitudes toward inquiry but did not differ in their use of inquiry activities. Graduates of the Post-Degree Program held more positive attitudes toward inquiry but were not implementing more of these activities in the classroom. A similar finding in which differences in attitude were not translated into differences in practice was found when results of this study were compared to results of an earlier follow-up study conducted by Swami (1975). The mean SCACL:TP composite score for program graduate teachers from this study was significantly lower than for program graduates participating in Swami's study while the mean subscale B CAST:PP score did not differ for individuals participating in the two studies. This indicates, that despite more positive attitudes toward inquiry among graduates who participated in Swami's study 10 years ago, they did not implement more inquiry activities in the classroom than program graduates who participated in this study.

These findings point to the possible impact the school setting has on the use of inquiry. Data from this study found a number of situational variables related to the use of inquiry and are discussed in the next section. These situational variables deal with the students and school administration. Situational variables not examined in this study were the attitudes and practices of peer teachers. It is possible that these also impact upon program graduates use of inquiry. Support for this idea comes from a study of OSU project and non-project pre-service teachers conducted by Brown (1972). He found that the cooperating teachers' use of inquiry activities was the strongest influence on pre-service teachers' use of such activites. It is possible that the relationship he found between cooperating teachers and pre-service teachers also exists between in-service teachers.

The results of this study present evidence to support the idea that the Post-Degree Program is a valuable alternative approach to science teacher certification. For the individuals electing to enroll, the program has been shown to be as effective as the Undergraduate Program in developing competencies needed to be successful in the classroom and does so in less time.

Attitudes Toward Inquiry

Results of this study found that teachers who felt more positive toward using inquiry activities possessed a more humanistic student control orientation. This finding appears reasonable because to teach science by inquiry requires less restrictive, less teacher-controlled activities. These types of activities would require teachers to be more trusting of students and to have confidence in students' ability to be self-disciplining and responsible. This finding, which suggests that humanistic control orientation is highly compatible with a philosophy supportive of inquiry instruction, is supported by previous research (Hoy and Blankenship, 1972; Jones and Blankenship, 1970; and Jones and Harty, 1978).

Results of several studies have shown that class size and administrative support influence teachers' use of inquiry instruction (James, 1978; Pugh, 1965; and Swami, 1975). The present study provides evidence to suggest that these two variables also influence teachers' attitudes toward inquiry instruction. Teachers who felt class size was not a problem and who worked with administrators that provided support from classroom discipline and instruction held more positive attitudes toward inquiry instruction. It appears that when teachers give thought to the appropriateness of inquiry they do so, in part, by reflecting upon the students and administrators with whom they teach.

Use of Inquiry

The use of inquiry was found to be strongly associated with positive student-teacher relationships and ability to effectively manage the classroom. This latter finding supports the conclusion that management success impacts upon instruction and suggests that teachers who have difficulties in controlling students are less likely to use activities, such as inquiry, that are difficult to manage. In addition, the finding that management success was more closely associated with use of inquiry than it was with positive attitudes toward inquiry indicates that discrepancies between teacher attitude and practice may be largely related to classroom management difficulties. This conclusion is compatible with findings of Swami (1975) and Shay (1974). Swami reported that teachers who indicated having discipline-related problems implemented fewer inquiry-oriented activities. Similarly, Shay found that teachers who valued inquiry activities but did not use them in the classroom reported problems in control of classroom operations.

Findings of the present study indicate that administrative support for discipline and instruction are important conditions associated with teachers' use of inquiry instruction. This is also supported by earlier studies using teacher graduates from science education programs at The Ohio State University (Brewington, 1971; Cignetti, 1971; and Swami, 1975). If administrators want to promote inquiry instruction, it would behoove them to work with their science teaching staff to insure appropriate support is provided.

The results of this study found that the school setting (urban, suburban or rural) was not significant correlated to program graduates' use of inquiry. This apparent stability in the use of inquiry over varying school settings may be explained, in part, by the influence of the Undergraduate and Post-Degree Programs. During the programs, pre-service teachers acquire early field experience in both urban and suburban school settings. It is possible that this exposure may help to equip them with the skills needed to successfully implement inquiry activities in a diversity of settings during later in-service experience.

Results of this study also found that the number of years of teaching experience was not significantly correlated to the use of inquiry activities, thus indicating that graduates with one to five years of teaching experience were similar in the use of inquiry. This relationship was also found by Swami (1975) in his follow-up study of OSU program graduates. If this stability in teaching practices over varying years of experience is related to the impact of the pre-service programs, it does suggest that the programs have a long term influence on graduates' use of inquiry activities in the classroom.

The finding that students' assessment of teachers' use of inquiry is influenced by the grades they receive points to the possible biasing of results from earlier studies assessing outcomes of the science education certification program at The Ohio State University (a review of these studies is found in Chapter II).

Classroom Management Practices

This study found that students who were taught by teachers who had strong classroom management skills felt that they learned a great deal in class. This is perhaps a result of teachers who are successful classroom managers, and who therefore waste little class time on discipline problems, are able to spend more time on-task dealing with learning activities. This idea is consistent with research on classroom management in which it has been shown that effective management practices result in increased student achievement (Anderson, Evertson, and Emmer, 1980; Evertson and Emmer, 1982; and Sanford, 1984). Although this study did not attempt to directly measure student achievement, it did measure student perception of what was learned in class. If amount learned in class, as perceived by students, can be taken as an indirect measure of achievement, results of this study provide additional support for the idea that management success impacts upon student achievement.

This study found that chemistry teachers were more likely to be rated high in their classroom management skills than teachers of other science content areas. A possible explanation for this finding is that chemistry is perceived as an orderly, exact science and students in laboratories work with potentially dangerous materials, more so than in other science content areas. As a result, chemistry teachers may perceive a stronger need to maintain a well-managed classroom and therefore, strive to meet this objective.

Recommendations

Related to the Programs

1. Results of this study found management success an important condition associated with the use of inquiry. In order to promote inquiry, pre-service teachers should be exposed to recent research in the area of classroom management and be encouraged to apply these findings during field experiences.

2. The science education programs should continue to emphasize the use of inquiry and strive to place pre-service teachers in field settings which are supportive of this type of instruction. Results of this study indicate these settings would be ones where classroom discipline is not perceived as a problem and the administration provides sufficient support for discipline and instruction.

3. Pre-service teachers should be given opportunities to develop skills in communicating with school administrators so that they make optimum use of support for discipline and instruction provided by the administration.

4. The science education programs should place an emphasis on the importance of developing a positive student-teacher relationship, as it was found to be closely related to the use of inquiry.

Related to the School Administration

1. In order to promote inquiry instruction, school administrators should make efforts to work with individual teachers to provide the support for discipline and instruction which best meets the needs of each teacher.

2. School administrators should be sensitive to the constraints that class size imposes on the teachers' attitudes toward using inquiry activities.

3. School administrators should consider using the CAST:PP and SCR as formative evaluation instruments with in-service teachers.

Related to Future Research

1. Studies similar to this one should be conducted in order to contribute to past and present longitudinal efforts to examine outcomes of the science education programs.

2. Studies assessing the attitudes toward inquiry as well as the use of inquiry and classroom management practices of peer teachers working with program graduates should be conducted. These data could be used to determine what influence peer teachers have on the attitudes and practices of program graduates.

3. Studies should be conducted to determine the impact that teachers' attitudes and practices have on student outcomes related to concept knowledge, process skills and affective skills.

4. Studies should be conducted to further examine differences found between Undergraduate and Post-Degree graduates with respect to

their attitudes toward the use of inquiry activities. By assessing these attitudes before, during and after the program, it would be possible to determine if these are pre-existing differences or if they develop as a result of the experiences provided by the programs. If differences are found to exist before students begin the program, it would be valuable to collect data on the quantitative and qualitative differences in science content backgrounds for these beginning pre-service teachers. This would help identify a possible reason for the differences. If differences are found to exist only after completion of the program, it is likely that the experiences provided during the program are responsible. This information could be used for possible program modification.

5. When the CAST:PP is used in future studies, data on student characteristics should be collected and examined to determine what influence they might have on student responses. This would serve to enhance the validity of the instrument. In addition to data on personal characteristics and attitudes toward science, data on whether or not students have taken inquiry-oriented science classes in previous years should be collected.

APPENDIX A

PROGRAM DESCRIPTIONS

1. Undergraduate Program
2. Post Degree Program

FORMAT FOR UNDERGRADUATE PROGRAM IN SCIENCE EDUCATION (1981-82)

The project consists of five-quarters (J-1, J-2, J-3, S-1 and S-2) which incorporate course work and experiences meeting all* state certification requirements. Please do not enroll for any "required" education or psychology courses (except Psychology 100) until you have consulted with an advisor in Science Education.

	AUTUMN QUARTER	WINTER QUARTER	SPRING QUARTER
JUNIOR YEAR	J-1 (ED:SC&MA 489.02 5 hrs) (EDUC 450 6 hrs) Junior High (Middle) School Students should plan to devote either five mornings (9-12) or five afternoons (1-4) to the junior program each week. Two half days are spent in a junior high or middle school working with teachers, mathematics classes, and individual students, and the other three half-days are spent with professional introduction to education coursework (Educ 450). School experiences are coordinated with this coursework, and focused specifically on science or mathematics curriculum in the schools.	J-2 (ED:SC&MA 489.01 5 hrs) (EDUC 451 6 hrs) Elementary School Students should plan to devote either five mornings (9-12) or five afternoons (1-4) to the junior program each week. Two half days are spent in an elementary school working with teachers and students, while the other three half-days are spent with professional introduction to education coursework (Educ 451). School experiences are coordinated with this coursework and are focused on science learning or mathematics learning.	J-3 (ED:SC&MA 489.03 3 cr) (ED:SC&MA 551 4 cr) JUNIOR OR SENIOR HIGH SCHOOL 1) Teach laboratory activities three periods/week in your content area 2) Observe a) other science teachers b) other teachers 3) Assist cooperating teacher in other duties 4) Attend ED 551 campus classes 5) Perform required laboratory activities in 274 Arps Hall Time needed for project: 1) three consecutive half days a week (for 7 weeks) (T,W,R, AM or PM) for school experience 2) two two-hour blocks for on-campus course (M,F, AM) 3) additional on campus laboratory work
SENIOR YEAR	S-1 (ED:SC&MA 587.27 6 cr) (ED:SC&MA 627 3 cr) (ED:SC&MA 692.27 2 cr) JUNIOR & SENIOR HIGH SCHOOL (Inner City - Suburban) 1) Participate in orientation program & VIP sessions 2) Teach half days in an inner-city school for half the quarter; outer city school for the other half 3) Complete expectations for ED:SC&MA 627 Time needed for project: 1) half days daily (AM) and T, R, 1-3 with additional 2 hours arr.	S-2 (ED:SC&MA 587.27 12-15 cr) JUNIOR OR SENIOR HIGH SCHOOL Full-time student teaching in either an inner-city type or more suburban-type school (type of school determined by the student in consultation with advisor in program) Time needed for project: 1) the school day, plus one 2 hour seminar	CONTENT QUARTER S-1 - S-2 sequence may be completed Autumn and Winter Quarters, or Autumn and Spring Quarters. * Two additional F&R courses are required. These 3 hour courses can be taken at any time during the program. They should be selected from ED:F&R Foundations of Education I, II, or III.

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GENERAL FORMAT OF POST-DEGREE PROGRAM
SCIENCE AND MATHEMATICS EDUCATION

ENTRANCE REQUIREMENTS

1. Completion of B.A. or B.S. degree in science or mathematics
2. Grade point average of 2.25 if interested in certification only or 2.7 if planning to enroll in Graduate School*

   * (2.25 GPA applies to overall GPA and to GPA in science or math, as well)

3. Transcript(s) from colleges and universities where credit was received
4. Completion of Post-Degree application packet (items 4 & 3 are part of this)
5. Interview with faculty member
6. Completion of application to College of Education or to Graduate School
7. For certification purposes, all post-degree students must complete Educ 600 (Media Skills) and two "foundations of education" courses.

SUMMER QUARTER	AUTUMN QUARTER	WINTER QUARTER
8-11:00 Field experiences in Columbus Summer School 12:00-1:00 On-campus classes in learning theory 1:00-3:00 General Methods Educ 600 (time arranged-1 credit) 14 hours of credit	8-12:00 Contrasting Contents 5 weeks in inner-city school & 5 weeks in suburban school; one will be a junior high or middle school and one a senior high 1-3:00 On-campus:Microcomputers, special methods, VIP Seminar 4:30-6:30 Curriculum 18 credit hours	8-4:00 Full-time student teaching, plus an occasional seminar 15-18 hours credit CERTIFICATION OCCURS AT THE END OF THIS QUARTER, PROVIDED SCIENCE OR MATH CONTENT REQUIREMENTS ARE MET AND THE THREE GENERAL CERTIFICATION COURSES ARE SATISFACTORILY COMPLETED.

FOR THOSE INDIVIDUALS PLANNING TO COMPLETE A MASTER'S DEGREE

SPRING QUARTER	SUMMER QUARTER	1st YEAR OF TEACHING
Graduate work in * 1) science or mathematics 2) science-math education and/or education	Same as Spring Quarter *	Completion of remaining M.A. requirements (any coursework, M.A. project, examination)
*Coursework is to be selected with advice from M.A. advisor, based on content background and interests of student as well as Graduate School requirements.	Work needed to complete M.A. program involves 50 hours of credit, without a thesis; of which 20-25 hours are to be graduate courses in science or mathematics. College of Education requirements involve 6 hours of work from identified courses in Education, Psychology or Sociology.	Science and Mathematics Education program requirements involve graduate level courses in curriculum, learning theory and/or evaluation (2 of 3) in science-math education.

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APPENDIX B

LETTER TO GRADUATES AND ADMINISTRATORS

1. Employment Status Letter
2. Principal Letter
3. Instructions for Administering Instruments

OSU

The Ohio State University

College of Education
Department of Educational Theory and Practice
Science and Mathematics
249 Arps Hall
1945 North High Street
Columbus, Ohio 43210-1172
Phone 614-422-4121

December 12, 1985

Dear Program Graduate,

The Faculty of Science and Mathematics Education at The Ohio State University is currently attempting to identify the employment status of those individuals who received science teacher certification through the teacher education program. This information is important to us as we look toward reviewing our present program.

Enclosed you will find an Occupational Status Survey. It would be most appreciated if you would please take a few minutes to complete this survey so that we might have an up-to-date record of the employment status of our graduates. Your help in this matter is crucial to the success of our efforts.

Please return the enclosed survey at your earliest convenience in the return envelope provided.

Thank you.

Sincerely,

Patricia E. Blosser

Patricia E. Blosser
Professor Science Education

Melissa M. Conrath

Melissa Conrath
Graduate Research Associate Science Education

Stanley L. Helgeson

Stanley L. Helgeson
Professor Science Education

OCCUPATIONAL STATUS SURVEY
THE FACULTY OF SCIENCE AND MATHEMATICS EDUCATION

Name ____
last first middle/former

Present Address ____

City ____________________ State __________ Zip ______

Telephone ( ) ___ - __________

EMPLOYMENT STATUS

_____ I am not currently employed as a teacher in a public or private school.

Current employment or position ____________________________
(if none please indicate)

_____ I am currently employed as a teacher in a public or private school.

Subjects taught ______________________________________

______________________ ______________________
name of school district name of principal

Name and address of school building:

______________________ ______________________
name of school building address

____
city, state

____
zip code

INSTRUCTIONS FOR ADMINISTERING THE INSTRUMENTS

Thank you for agreeing to participate in the follow-up study of graduates from the science education program at The Ohio State University. Below is an outline for administering the instruments enclosed in this packet.

Materials Enclosed

A. To be completed by students in any one of your science classes:

1. Checklist for Assessment of Science Teachers: Pupil Perception.
2. Student Classroom Rating.
3. Student Questionnaire

(These three instruments have been stapled together as one packet for each student.)

A single answer sheet is provided for students to respond to all three of the above instruments.

B. To be completed by you, the program graduate:

1. Teacher Questionnaire (answers to be written on the questionnaire itself).
2. Science Classroom Activity Checklist: Teacher's Perception (answer sheet provided).

How to Administer

A. Student materials

1. Select any one of your science classes to administer the three instruments which are stapled together as one packet.
2. Ask students to place their answers on the answer sheet provided.
3. Student names are not required on the answer sheets. This is done to promote honest responses. Please encourage them to respond as honestly as possible.
4. It should take the class approximately 20-25 minutes to complete the materials.

B. Teacher materials

1. Please complete the two instruments (Teacher Questionnaire and the Science Classroom Activity Checklist: Teacher Perception) at your convenience.
2. Answers for the Teacher Questionnaire should be placed on the questionnaire itself. An answer sheet is provided for the Science Classroom Activity Checklist: Teacher Perception.

Page 2

Return of Materials

A. Please place the following materials in the envelope included in your packet.

   1. Student answer sheets.

   2. Teacher Questionnaire.

   3. Answer sheet to the Science Classroom Activity Checklist: Teacher Perception.

B. Some of the graduates participating in this study have been asked to return the materials through the U.S. mail in the enclosed envelope. For those individuals, postage has been provided on the envelope. For others, arrangements have been made to have the materials picked up by someone from Ohio State.

Thank you, again, for your cooperation.

Melissa Conrath
Melissa Conrath
Research Associate

Patricia E. Blosser
Patricia E. Blosser
Professor of Science Education

MC/PEB/amp
Enclosures

APPENDIX C

INSTRUMENTS

1. Science Classroom Activities Checklist: Teacher's Perception (SCACL:TP)
2. SCACL:TP Answer Key
3. Checklist for Assessment of Science Teachers: Pupils' Perception (CAST:PP)
4. Student Classroom Rating (SCR)

SCIENCE CLASSROOM ACTIVITY CHECKLIST: TEACHER'S PERCEPTIONS

The purpose of this checklist is to determine the types of activities which you feel should take place in your science classroom. The classroom, for purposes of this instrument, is defined to include the laboratory. Each statement describes some classroom activity(ies). The activities are not judged as either good or bad; therefore, this checklist is not a test and is not designed to evaluate you. You are to read each statement and decide if the statement is true or false based on what you feel should take place in your science classroom.

SAMPLE QUESTION

Checklist	Answer Sheet
	T F
1. All students should always wear laboratory aprons in the laboratory.	1. ( ) ( )

If the statement describes what should occur in your science classroom, place an "X" in the space under the letter T (True) on the answer sheet; if it does not, place an "X" in the space under the letter F (False).

All of the statements must be responded to, so if a statement is not completely true or false you will have to decide whether it is more true than false or vice-versa and make the mark accordingly.

All answers should be recorded on the answer sheet provided. NO MARKS should be made on the checklist.

There is no time limit for completing this checklist.

Begin

1. The student's role is to copy down and memorize what the teacher tells him/her.
2. Students should frequently be allowed time in class to talk among themselves about ideas in science.
3. Over 25% of the class time should be devoted to students answering orally or in writing answers to questions that are in the textbook or in study guides.
4. Classroom laboratory activities, such as experiments and demonstrations, should usually be performed by students rather than by the teacher.
5. Science classes should provide for some discussion of the problems facing scientists in the discovery of a scientific principle.
6. If a student disagrees with what the teacher says, he/she should say so.
7. Most questions students ask in class should be to clarify statements made by the teacher or the text.
8. It is important that students discuss the evidence behind a scientist's conclusion.
9. A majority of class time should be spent lecturing about science.
10. A teacher should be very hesitant to admit his/her mistakes.
11. A teacher should generally provide the answer when students disagree during a discussion.
12. It is desirable for teachers to frequently repeat to their students almost exactly what is in the textbook.
13. A teacher should frequently cause students to explain the meanings of statements, diagrams, graphs, etc.
14. Science should be presented as having almost all of the answers to questions about the natural world.
15. Teacher questions should require students to think about ideas they have previously studied.
16. Teacher questions should force students to think about the evidence that is behind the statements that are made in the textbook.
17. The general objectives of a lesson should be understood by the students before work on the lesson is begun.
18. Students should learn most of the details stated in the text.
19. It is important that students frequently write out definitions to word lists.

20. When reading the textbook, students should be expected to look for the main problems (ideas) and for the evidence that supports them.

21. Students should be taught how to ask themselves questions about statements in the text.

22. The textbook and the teacher's notes should provide about the only sources of scientific knowledge for class discussion.

23. Students should often read in sources of science information (books, magazines, etc.) other than their textbook.

24. The student should often be required to keep outline notes on sections of the textbook.

25. The textbook is based on scientific fact and as such should not be questioned by students.

26. Tests should include many items based on what students have learned in their laboratory investigations.

27. Tests should often require writing out the definitions of terms.

28. Tests should often ask students to relate ideas that they have learned at different times.

29. Tests should often require the figuring out of answers to new problems.

30. Tests should provide data the students have not seen previously and ask the students to draw conclusions from these data.

31. Tests should often require students to put labels on drawings.

32. Student evaluation should include formal means of evaluating the performance of skills learned in laboratory activities; e.g. observation, interpretation of data, etc.

33. Tests should seldom contain problems which involve the use of mathematics in their solution.

34. Students should occasionally be given problems for which they must design ways of looking for solutions.

35. Students should occasionally be given research reports and asked to evaluate the procedures used in looking for solutions to the problem.

36. It is a waste of time after a test to have students discuss questions they have on the test.

37. Students should be told step-by-step what they are to do in the laboratory.

38. Students should spend time before most laboratory investigations in discussing the purpose of the experiment.

39. Equipment and solutions should not be gathered and/or prepared in advance of laboratory sessions.

40. Science laboratories should meet on a regularly scheduled basis (such as every Tuesday and Friday).

41. The laboratory should often be used to investigate a problem that comes up in class.

42. A laboratory should usually precede the discussion of the specific topic in class.

43. Laboratory activities should usually be related to the topic that is being studied in class.

44. Students should usually know the answer to a laboratory problem that they are investigating before they begin the experiment.

45. Most laboratory activities should be done by the teacher or other students while the class watches.

46. It should be expected that the data collected by various members of a class will often be different for the same experiment.

47. During an experiment the students should record their data at the time they make their observations.

48. Students should sometimes be asked to design their own experiments to seek answers to a question that puzzles them.

49. Students should often ask the teacher if they are getting correct results in their experiments.

50. The teacher should answer most of the students' questions about laboratory work by asking the students questions.

51. One fourth or less of class time should be spent doing laboratory work.

52. Students should always be required to follow teacher or laboratory manual specified ways of doing laboratory work.

53. Laboratories should be directed at students thoroughly learning the names of specific structures and specific sequences of events.

54. Laboratory observations should be discussed within a day or two after the completion of the activity.

55. After completion of a laboratory activity individual students or student groups should have an opportunity to compare data.

56. Students should be required to copy the purposes, materials, and procedures used in their experiments from the text or laboratory manual.

57. Students should be allowed to go beyond the regular laboratory exercise and do some experimenting of their own.

58. Students should have an opportunity to analyze the conclusions that they have drawn in the laboratory.

59. A class should be able to explain all unexpected data collected in the laboratory.

60. Students should spend time in the interpretation of graphs and tables of the data which they collect.

SCIENCE CLASSROOM ACTIVITY CHECKLIST: TEACHER'S PERCEPTIONS

ANSWER KEY

1. F
2. T
3. F
4. T
5. T
6. T
7. F
8. T
9. F
10. F
11. F
12. F
13. T
14. F
15. T
16. T
17. T
18. F
19. F
20. T
21. T
22. F
23. T
24. F
25. F
26. T
27. F
28. T
29. T
30. T
31. F
32. T
33. F
34. T
35. T
36. F
37. F
38. T
39. F
40. F
41. T
42. T
43. T
44. F
45. F
46. T
47. T
48. T
49. F
50. T
51. F
52. F
53. F
54. T
55. T
56. F
57. T
58. T
59. F
60. T

2. *CHECKLIST FOR ASSESSMENT OF SCIENCE TEACHERS: PUPIL'S PERCEPTIONS

Directions: Circle the letter on the answer sheet which most closely states your honest behavior of your teacher or what usually happens in your classroom. Mark only one response under each of the questions. Make all your responses on the answer sheet. Make no marks on this booklet. You may possibly find that each phrase in a particular response does not apply to your teacher. Please mark the one that most closely describes your teacher or what usually is happening in your classroom. Read all the responses before you choose one.

For example, if Answer "B" for a particular question best describes your feelings, circle the letter in the appropriate space on the answer sheet.

12. A [✓ B] C D E

---

*This instrument has been adopted from the work of William R. Brown, Betty J. Brown, and Robert W. Howe, 249 Arps Hall, The Ohio State University, November, 1970 edition.

CAST: PP

1. How does your teacher keep his class in order?

   a. Our teacher makes us feel free and natural. We are very interested in and busy with school work. We are able to take care of ourselves.

   b. Our teacher sees to it that work goes on with little or no stopping. We usually pay attention to the work at hand.

   c. Our teacher is able to bring the class back to order with a few warning looks or words. The room is fairly quiet. Some students are whispering and not paying attention. The teacher is usually aware of minor misbehaviors.

   d. Our teacher tries but is unable to control the class. We are restless. We do not pay attention. The classroom is noisy.

   e. Our teacher is strict and rules with an iron hand. Most students are tense and nervous. The classroom is very quiet. Students do not respect our teacher.

2. Is your teacher more interested in you or in the subject he/she is teaching?

   a. Our teacher is interested in us as people. He/she is aware that we can do, are interested in, and need different things. Our teacher wants to help us with our personal problems as well as with the subject he/she is teaching. He/she tries and often does help us with our problems.

   b. Our teacher is aware of our different needs but does little to help us with them. He/she pays attention to our need to learn the subject he/she is teaching. He/she expects less of the lower ability students than of the higher ability students.

   c. Our teacher is aware of our different needs but thinks the teacher should teach only his/her subject. Our teacher talks about our individual differences but does little about the differences.

   d. Our teacher does not pay attention to any of our individual needs. He/she is interested only in the subject he/she is teaching. Sometimes we do "busy work" that has little meaning to us.

   e. Our teacher ignores us as individuals. He/she thinks only of learning the subject. Every student must learn the same things. We do "busy work", and we usually do work from the textbook.

CAST: PP

3. How does your teacher feel about students?

   a. Our teacher looks at us the way we really are. He/she is friendly and understanding. He/she likes us and enjoys having us around. He/she listens to our opinions.

   b. Our teacher understands that we are able to learn and grow up but does little to help us. He/she seems to want to know us better.

   c. Our teacher often does not try to understand our feelings or opinions. He/she thinks we "just need to grow up". He/she usually grades us by what adults can do rather than by what we can do.

   d. Our teacher thinks of us as "little adults", not as teenagers. He/she tends to expect too much or too little of us.

   e. Our teacher does not try to understand us. He/she is not interested in the opinions of teenagers. He/she is often ill at ease or uncomfortable when we are with him/her.

4. How does your teacher understand students who have behavior problems?

   a. Our teacher is not as worried about students who misbehave in class as he/she is about students who are "too quiet". He/she tries to figure out why students do certain things and help them solve their problems.

   b. Our teacher is aware that students have problems. He/she looks for reasons why students misbehave. He/she expects students to behave even if they have problems, and he/she will punish them if he/she has to.

   c. Our teacher usually is not aware that students have reasons for doing the things they do. He/she knows he/she should learn something about the background of his/her students, but often punishes instead.

   d. Our teacher is not aware that students have problems. He/she treats all students who misbehave the same way. He/she always punishes them.

   e. Our teacher thinks students who do not obey are the most serious problems. He/she thinks the shy, quiet students are the "perfect students". He/she does not try to understand why students act the way they do. He/she punishes all students who misbehave.

CAST: PP

7. What does your teacher do in class?

   a. Our teacher helps us understand the reason or purpose for a lesson before we start it. Our teacher often questions us on ideas we studied earlier. He/she asks us for the facts behind the statements in our textbook. Our teacher often asks us to explain diagrams and graphs.

   b. Our teacher often questions us on ideas we studied earlier. He/she asks us for the facts behind some of the ideas in our textbook. He/she sometimes asks us to explain diagrams and graphs.

   c. Our teacher spends most of the time telling us about science. He/she repeats much of what our textbook says. Our teacher sometimes questions us about ideas we studied earlier.

   d. Our teacher sometimes repeats exactly what our textbook says. If students do not agree, our teacher usually tells us who is right. Most of the time our teacher tells us about science.

   e. Our teacher shows us that science has most of the answers to questions about the natural world. If students do not agree during a discussion, our teacher tells us who is right. Our teacher often repeats exactly what our textbook says.

8. How does your teacher use the textbook and reference materials?

   a. Our teacher expects us to find the major ideas in our textbook. We must also find the facts to prove the ideas. He/she shows us how to question ideas in our textbook. Our teacher often provides time to read about science in magazines and other books.

   b. Our teacher expects us to learn some of the details in our textbook. We can use magazines and other books in the room if we want. Our teacher shows us how to question ideas in our textbook.

   c. Our teacher expects us to learn many of the details in our textbook. We look for some of the major ideas in our textbook. We also find the facts to prove the ideas. We sometimes outline parts of our textbook. The only science we talk about is from our textbooks and our teacher's notes.

   d. Our teacher expects us to outline part of our textbook. The only science we talk about is from our textbook and our teacher's notes. We must learn most of the details in our textbook.

   e. Our teacher does not like us to question information from our textbook. We often write out definitions to words. We must outline parts of our textbook. We must memorize most of the details in our textbook.

CAST: PP

9. What are your tests like? How are they used?

   a. Our tests have many questions about our laboratory work. Our tests often require us to figure out answers to new problems. Sometimes we find ways of looking for answers to problems. Often we do things on the test that we have learned in our laboratory such as making observations and explaining data.

   b. Our tests have many questions about our laboratory work. Our tests sometimes require us to figure out answers to new problems. Sometimes we do things on the test that we have learned in our laboratory such as making observations and explaining data.

   c. Our tests sometimes ask us to label drawings. Our tests sometimes have questions about our laboratory work. Sometimes we must tell about ideas that we learned earlier.

   d. Our tests often ask us to write out definitions to words. We do not use mathematics to answer questions on our tests. Often we must label drawings.

   e. Our tests often ask us to write out definitions to words. Often we must label drawings. We do not use mathematics to answer questions on our tests. We do not have a chance to talk about the test questions in class.

10. What do you do in the laboratory?

   a. We talk about the reasons for an experiment before we do it. We often try our own ways of doing the laboratory work. We can compare our answers to those of others when we are finished. We are allowed to do experiments on our own.

   b. We talk about the reasons for most experiments before we do them. The data one student gathers from an experiment are often different from the data gathered by another student. We may do some experimenting on our own.

   c. We sometimes talk about the reasons for experiments. We sometimes compare our answers to those of others when we are finished. We spend less than one third of our time doing laboratory work.

   d. We sometimes know the answer to a question before we do an experiment. We seldom talk about the reason for an experiment. We spend less than one fourth of our time doing laboratory work.

   e. We are not allowed to do experiments on our own. We know the answer to a question before we do an experiment. We do not talk about the reasons for an experiment. We spend very little of our time doing laboratory work.

STUDENT CLASSROOM RATING

BELOW ARE QUESTIONS ABOUT WHAT GOES ON IN YOUR SCIENCE CLASSROOM. CHOOSE THE ANSWER WHICH BEST DESCRIBES YOUR FEELINGS AND CIRCLE THE APPROPRIATE ANSWER ON YOUR ANSWER SHEET.

1. Does your teacher give clear directions and assignments?

   A. Never clear
   B. Occasionally clear
   C. Usually clear
   D. Always clear

2. How often does your teacher allow an activity to continue too long, until students begin to get restless and no longer pay attention?

   A. Always
   B. Usually
   C. Occasionally
   D. Never

3. How obedient are the students in your classroom?

   A. Students commonly defy the teacher and are disobedient
   B. Sometimes students obey and sometimes they don't
   C. Students usually obey the teacher
   D. Students almost always obey the teacher

4. How often does your teacher have materials for laboratories available and ready when the lab begins?

   A. Lab is always delayed while the teacher gathers materials
   B. Lab is usually delayed while the teacher gathers materials
   C. Only on occasion is lab delayed because materials are not ready
   D. Lab is never delayed, materials are always available
   E. Does not apply, we do not have labs in science class

5. When working in small groups, such as in lab, does your teacher check to see how your work is coming along?

   A. Never
   B. Occasionally
   C. Usually
   D. Always

6. Does your teacher enforce rules about acceptable student behavior?

   A. Teacher never enforces rules
   B. Teacher occasionally enforces rules
   C. Teacher usually enforces rules
   D. Teacher always enforces rules

7. What is the usual length of time between the time the bell rings and when your teacher begins an activity?

   A. Between five and ten minutes
   B. Between three and five minutes
   C. Between one and three minutes
   D. Less than one minute

8. At what point in time in a typical class period does your class begin to lose its attention or concentration?

   A. Never gets it together
   B. Shortly after the beginning of class
   C. Halfway to three-fourth of the way through class
   D. Never loses attention or concentration

9. How successful is your teacher in getting students' attention by using a signal such as clapping hands or verbally asking for students' attention?

   A. Not very B. Occasionally C. Usually D. Very

10. How often does your teacher let the class get out of hand to a point where most of the students are not doing what they are supposed to be doing?

   A. Never B. Occasionally C. Usually D. Always

APPENDIX D

QUESTIONNAIRES

1. Student Questionnaire
2. Teacher Questionnaire
3. Administrator Questionnaire

STUDENT QUESTIONNAIRE

Below are some questions related to your science classes in school. To answer, please circle the most appropriate letter. Place your answers on this sheet. We ask that you answer honestly. Your answers will be kept strictly confidential.

1. How do your grades in this science class compare to your other classes?
   - A. higher than any of my other grades
   - B. higher than most of my other grades
   - C. about the same as my other grades
   - D. lower than most of my other grades
   - E. lowest of all my grades

2. In general, what grades do you get in this class?
   - A. I usually get A's
   - B. I usually get B's
   - C. I usually get C's
   - D. I usually get D's
   - E. I usually get E's or F's

3. In general, do you enjoy being in this class?
   - A. never
   - B. rarely
   - C. sometimes
   - D. usually
   - E. always

4. In general, have you enjoyed your science classes before this year?
   - A. never
   - B. rarely
   - C. sometimes
   - D. usually
   - E. always

5. In general, have you learned much in this class?
   - A. nothing
   - B. very little
   - C. an average amount
   - D. quite a lot
   - E. a great deal

6. Has this class helped increase your interest in science?
   - A. definitely no
   - B. mostly no
   - C. uncertain
   - D. mostly yes
   - E. definitely yes

7. Are you looking forward to taking more courses in science?
   - A. definitely no
   - B. mostly no
   - C. uncertain
   - D. mostly yes
   - E. definitely yes

8. What is your sex?
   - A. female
   - B. male

TEACHER QUESTIONNAIRE

This questionnaire is designed to collect information about your academic background and teaching load. All information will be kept confidential.

Please feel free to add additional comments.

1. Name ____
Last First

2. Age in Years __________

3. Please indicate degree(s) you have to date completed:

		Major	Minor	Institution	Year Completed
a.	B.S., B.A.	________	________	________________	________
	M.S., M.A.	________	________	________________	________

b. How many graduate quarter hours have you completed beyond your last degree:

______ 0-2
______ 3-9
______ 10-20 Hours
______ 21-30
______ 30+ Hours

c. What academic quarter year were you last enrolled in college:

________________ ____________
Quarter Year

d. How many quarter hours have you completed in the following science content areas since receiving certification at Ohio State?

	Completed at OSU Since Certification	Completed at Another Institution Since Receiving Certification
Life Science	_____	_____
Earth Science	_____	_____
Physics	_____	_____
Chemistry	_____	_____

4. Total number of years of teaching experience (include this year as one):

_______________ Years

5. Number of years teaching in current school (include this year as one):

____________ Years

6. Please name the professional organizations to which you belong.

____________________________ ____________________________

____________________________ ____________________________

b. How many state or national meetings of professional organizations do you usually attend each year?

_____ None _____ 1-2

_____ 3-4 _____ More than 4

7. Have you been involved in curriculum development committees in your school:

Within the last year? ______ yes ______ no

Within the last 2 years? ______ yes ______ no

8. How much influence do you feel you have in determining the science curriculum for your building (check one)?

______ Considerable ______ Some ______ None

9. How much influence do you feel you should have in determining the science curriculum for your building (check one)?

_____ Considerable ______ Some ______ None

10. a. Total number of preparations you have each day? _______

b. Total number of class periods you teach each day? _______

II. Using your class which is a part of this study, please respond to the following:

a. Title of class ____________________

b. Textbook used for this class:

____________ ____________ ____________
Name Author Year Published

c. Number of students in class ____________

d. Number of years you have taught this class (include this year as one) ____________

e. Is this class modified, regular, or advanced? ____________

f. Is the ability level of the students low, average, or high? ____________

g. Which of the following do you feel have been constraints to the effective functioning of your science class this year:

	Definitely a Problem	Somewhat a Problem	No Problem
1. Size of Room	1	2	3
2. Lack of equipment and supplies	1	2	3
3. Poor facilities for lab	1	2	3
4. Curriculum materials used	1	2	3
5. Lack of preparation time	1	2	3
6. Administrative and non-teaching responsibilities	1	2	3
7. Too large a class size	1	2	3
8. Lack of interest, motivation in students	1	2	3
9. Low ability level of students	1	2	3
10. Lack of parental encouragement, concern	1	2	3
11. Discipline, control, behavior problems	1	2	3
12. Academic range of students	1	2	3
13. Support from administration	1	2	3

h. Which best characterizes the type of science instructional materials you actually use in your school. (Check One)

_____ A textbook; use with very little modification

_____ A textbook: use parts and supplement with other materials

_____ Several textbooks, use each when it is most appropriate

_____ Teacher developed materials for a local program

_____ Other (specify) ______________________________
____

i. Which best characterizes the type of science instructional materials you prefer to use in your school. (Check one)

_____ A textbook: use with very little modification

_____ A textbook: use parts and supplement with other materials

_____ Several textbooks, use each when it is most appropriate

_____ Teacher developed materials for a local program

_____ Other (specify) ______________________________
____

14. When you have a disciplinary problem what kind of help can you expect from the administration? (Check One)

_____ All the help I need

_____ Most of the help I need

_____ About half the help I need

_____ Little of the help I need

_____ None of the help I need

15. Are you satisfied or dissatisfied with the instructional support you receive from your administrators? (Check One)

_____ Very satisfied

_____ Satisfied

_____ Neutral

_____ Dissatisfied

_____ Very dissatisfied

Your responses to items 16 through 19 indicate what you feel should be done and what is done in your school to best achieve the goals of the science program. Use the response choices to the right to answer these items.

16. _____ Which approach should your principal/supervisor use concerning the science teacher using a variety and balance of instructional technique in the teaching of science?

17. _____ Which approach does your principal/supervisor use concerning the science teacher using a variety and balance of instructional techniques in the teaching of science?

18. _____ Which approach should your principal/supervisor use concerning the handling of student discipline problems by the science teacher?

19. _____ Which approach does your principal/supervisor use concerning the handling of student discipline problems by the science teacher.

Response Choices

a. The administrator helps the science teacher identify and clarify the areas of concern to the science teacher and then works with him to formulate plans for improvement and/or implementation.

b. The administrator makes the science teacher responsible for determining whether improvement is desirable, providing help when and if the science teacher asks for it.

c. The administrator identifies the science teacher's weaknesses and formulates plans for his improvement, perhaps making suggestions for implementing the improvement plans.

Student Control Ideology

Please indicate your personal opinion by circling the appropriate response.

20. It is desirable to require pupils to sit in assigned seats during assemblies. SA A U D SD

21. Beginning teachers are not likely to maintain strict enough control over pupils. SA A U D SD

22. Teachers should consider revision of their teaching methods if these methods are criticized by their pupils. SA A U D SD

23. The best principals give unquestioning support to teachers in disciplining pupils. SA A U D SD

24. Pupils should not be permitted to contradict the statements of a teacher in class. SA A U D SD

25. It is justifiable to have pupils learn many facts about a subject even if the facts have no immediate application. SA A U D SD

26. Too much pupil time is spent on guidance and activities and too little on academic preparation. SA A U D SD

27. Being friendly with pupils often leads to problems in the student/teacher relationship. SA A U D SD

28. Pupils can be trusted to work together without supervision. SA A U D SD

Please make any comments you wish concerning the Science Teacher Education Program you completed at the Ohio State University.

ADMINISTRATOR QUESTIONNAIRE

The following questionnaire is designed to gather information about your school as well as your opinions about the methods and goals of teaching. Your responses will be kept completely confidential.

Name ____

Educational Setting

1. What percent of students in your school building receive free or reduced-price lunches?

_____ 0-25%
_____ 25-50%
_____ 51% or more

2. Which best describes the community which is served by your school building?

_____ inner-city
_____ suburban
_____ rural

Science Instruction

3. What percent of time allocated for science instruction should be spent on each of the following activities?

_____ lectures
_____ questions, discussion
_____ demonstration
_____ seatwork
_____ laboratory work
_____ other (specify________________________________

4. Which type of science instructional materials do you prefer in your school? Please check one.

_____ A textbook: use with very little modification.
_____ A textbook: use parts and supplement with other materials.
_____ Several textbooks: use each when it is most appropriate
_____ Teacher developed materials for a local program.
_____ Other (specify) ______________________________

Student Control Ideology

Please indicate your personal opinion by circling the appropriate response.

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
5. It is desirable to require pupils to sit in assigned seats during assemblies.	SA	A	U	D	SD
6. Beginning teachers are not likely to maintain strict enough control over pupils.	SA	A	U	D	SD
7. Teachers should consider revision of their teaching methods if these methods are criticized by their pupils.	SA	A	U	D	SD
8. The best principals give unquestioning support to teachers in disciplining pupils.	SA	A	U	D	SD
9. Pupils should not be permitted to contradict the statements of a teacher in class.	SA	A	U	D	SD
10. It is justifiable to have pupils learn many facts about a subject even if the facts have no immediate application.	SA	A	U	D	SD
11. Too much pupil time is spent on guidance and activities and too little on academic preparation.	SA	A	U	D	SD
12. Being friendly with pupils often leads to problems in the student/teacher relationship.	SA	A	U	D	SD
13. Pupils can be trusted to work together without supervision.	SA	A	U	D	SD

Science Education Goals and Objectives

14. Please rank order the following goals from 1 through 5 based on your feelings of the importance of each goal for science education. With 1 being the most important and 5 being the least important.

____ Aid students in the development of positive attitudes toward science.
____ Develop skills in the process of scientific inquiry.
____ Recognize the role of science as an integral part of education.
____ Help students develop the skill of using the proper instruments and techniques of science.
____ Show how applications of the basic principles of science serve an important role in attacking society's problems.

15. Please circle the response which best describes the type of encouragement you give the science teacher(s) involved in this study.

    a. Feel free to do more or less what you want to do within your own classroom providing you stay within the existing legal constraints.

    b. Develop your unique potentialities within broad limits determined by such things as articulation of your courses with the rest of the science curriculum.

    c. Fullfill the role-expectations of your position as defined by your professional training and the philosophy and policies of the school district.

Select the response choice in the right hand column to answer the items 16 & 17. For each item respond to the question, "Which approach should you use ....?"

16. _____ Concerning the handling of student discipline problems by the science teacher?

17. _____ Concerning the science teacher using a variety and balance of instructional technique in the teaching of science?

Response Choices

a. The administrator should help the science teacher identify and clarify the areas of concern to the science teacher and then work with him to formulate plans for improvement and/or implementation.

b. The administrator should make the science teacher responsible for determining whether improvement is desirable, providing help when and if the science teacher asks for it.

c. The administrator should identify the science teacher's weaknesses and formulate plans for his improvement, perhaps making suggestions for implementing the improvement plans.

APPENDIX E

ANSWER SHEETS

1. Student Answer Sheet
2. SCACL:TP Answer Sheet

STUDENT ANSWER SHEET

CHECKLIST FOR ASSESSMENT OF SCIENCE TEACHERS

1. A B C D E
2. A B C D E
3. A B C D E
4. A B C D E
5. A B C D E
6. A B C D E
7. A B C D E
8. A B C D E
9. A B C D E
10. A B C D E

STUDENT CLASSROOM RATING

1. A B C D E
2. A B C D E
3. A B C D E
4. A B C D E
5. A B C D E
6. A B C D E
7. A B C D E
8. A B C D E
9. A B C D E
10. A B C D E

STUDENT QUESTIONNAIRE

1. A B C D E
2. A B C D E
3. A B C D E
4. A B C D E
5. A B C D E
6. A B C D E
7. A B C D E
8. A B

YOUR TEACHER'S NAME________________________

SCIENCE CLASSROOM ACTIVITY CHECKLIST: TEACHER'S PERCEPTIONS

ANSWER SHEET

	T	F
1.	( )	( )
2.	( )	( )
3.	( )	( )
4.	( )	( )
5.	( )	( )
6.	( )	( )
7.	( )	( )
8.	( )	( )
9.	( )	( )
10.	( )	( )
11.	( )	( )
12.	( )	( )
13.	( )	( )
14.	( )	( )
15.	( )	( )
16.	( )	( )
17.	( )	( )
18.	( )	( )
19.	( )	( )
20.	( )	( )
21.	( )	( )
22.	( )	( )
23.	( )	( )
24.	( )	( )
25.	( )	( )
26.	( )	( )
27.	( )	( )
28.	( )	( )
29.	( )	( )
30.	( )	( )
31.	( )	( )
32.	( )	( )
33.	( )	( )
34.	( )	( )
35.	( )	( )
36.	( )	( )
37.	( )	( )
38.	( )	( )
39.	( )	( )
40.	( )	( )
41.	( )	( )
42.	( )	( )
43.	( )	( )
44.	( )	( )
45.	( )	( )
46.	( )	( )
47.	( )	( )
48.	( )	( )
49.	( )	( )
50.	( )	( )
51.	( )	( )
52.	( )	( )
53.	( )	( )
54.	( )	( )
55.	( )	( )
56.	( )	( )
57.	( )	( )
58.	( )	( )
59.	( )	( )
60.	( )	( )

APPENDIX F

LIST OF ALL VARIABLES

List of Variables

Number	Symbol	Variable
1	AGE	Age of teacher. Actual age reported
2	PRO	Certification program. Post Degree = 0 Undergraduate = 1
3	BA	College degree level: BA/BS. No = 0 Yes = 1
4	BAHR	College degree level: BA/BS + hrs. No = 0 Yes = 1
5	MA	College degree level: MS/MA. No = 0 Yes = 1
6	MAHR	College degree level: MS/MA + hrs. No = 0 Yes = 1
7	GPA	College grade point average. Actual G.P.A.
8	REGENCY	Regency of college attendance. Actual number of quarters since enrollment
9	FIELD	Science Content Field: Life Science. No = 0 Yes = 1

List of Variables (continued)

Number	Symbol	Variable
10	YREXP	Years of Teaching Experience. Actual number of years
11	YREMP	Years employed at current school. Actual number of years
12	PROSC	Affiliation with professional science associations. No = 0 Yes = 1
13	PRONUM	Number of professional science associations. Actual Number
14	PROED	Affiliation with professional education associations. No = 0 Yes = 1
15	PROENUM	Number of professional education associations. Actual Number
16	MEETO	Professional meetings annually attend: None. No = 0 Yes = 1
17	MEET1	Professional meetings annually attend: One or two. No = 0 Yes = 1

List of Variables (continued)

Number	Symbol	Variable
18	MEET2	Professional meetings annually attend: Two or More. No = 0 Yes = 1
19	CURRDEV	Participation in curriculum development. No = 0 Yes = 1
20	INFLA	Teacher's perception of actual influence in determining curriculum. None = 1 Somewhat = 2 Considerable = 3
21	INFLS	Teacher's perception of influence he/she should have in determining curriculum. None = 1 Somewhat = 2 Considerable = 3
22	PREP	Number of preparations per day. Actual number
23	PERIOD	Number of class periods taught each day. Actual number
24	SIZE	Class size. Number of students: < 15 = 1 24-26 = 5 15-17 = 2 27-29 = 6 18-20 = 3 30-32 = 7 21-23 = 4 > 32 = 8

List of Variables (continued)

Number	Symbol	Variable
25	BIO	Subject of class: Biology. No = 0 Yes = 1
26	CHEM	Subject of class: Chemistry. No = 0 Yes = 1
27	PHY	Subject of class: Physics. No = 0 Yes = 1
28	GENSC	Subject of class: General Science. No = 0 Yes = 1
29	EARTH	Subject of class: Earth Science. No = 0 Yes = 1
30	YRSCLASS	Number of years taught this class. Actual numbers of years
31	MOD	Type of class: Modified. No = 0 Yes = 1
32	REG	Type of class: Regular. No = 0 Yes = 1

List of Variables (continued)

Number	Symbol	Variable
33	ADV	Type of class: Advanced. No = 0 Yes = 1
34	LOW	Ability level of students: Low. No = 0 Yes = 1
35	AVE	Ability level of students: Average. No = 0 Yes = 1
36	HIGH	Ability level of students: High. No = 0 Yes = 1
37-49		Perceived constraints to effective functioning of the classroom:
37	C37	Size of room
38	C38	Lack of equipment and supplies
39	C39	Poor facilities for lab
40	C40	Curriculum materials used
41	C41	Lack of prep time
42	C42	Administrative/non-teaching responsibilities
43	C43	Large class size
44	C44	Lack of motivation in students
45	C45	Low ability of students
46	C46	Lack of parental support
47	C47	Discipline, control problems
48	C48	Academic range of students
49	C49	Administrative support
		Responses for items 37 through 49: Definitely a problem = 1 Somewhat a problem = 2 No problem = 3

List of Variables (continued)

Number	Symbol	Variable
50	TQ50	Teacher uses textbook with little modification. No = 0 Yes = 1
51	TQ51	Teacher uses textbook, supplemented with other material. No = 0 Yes = 1
52	TQ52	Teacher uses several textbooks. No = 0 Yes = 1
53	TQ53	Teacher uses teacher developed materials. No = 0 Yes = 1
54	TQ54	Teacher prefers to use textbook with little modification. No = 0 Yes = 1
55	TQ55	Teacher prefers to use textbook, supplemented with other material. No = 0 Yes = 1
56	TQ56	Teacher prefers to use several textbooks. No = 0 Yes = 1

List of Variables (continued)

Number	Symbol	Variable
57	TQ57	Teacher prefers to use teacher developed materials. No = 0 Yes = 1
58	TQ58	Teacher perceived administrative support for discipline problems. None of the help needed = 1 Little of the help needed = 2 About half of the help needed = 3 Most of the help needed = 4 All of the help needed = 5
59	TQ59	Teacher satisfaction with instructional support received from administration. Very dissatisfied = 1 Dissatisfied = 2 Neutral = 3 Satisfied = 4 Very satisfied = 5
60	TQ60	Teacher perceives that the administrator should make the teacher responsible, provide help when requested with respect to helping the teacher use a variety of instructional techniques. No = 0 Yes = 1
61	TQ61	Teacher perceives that the administrator should help the teacher identify weaknesses and work together to plan for improvement with respect to helping the teacher use a variety of instructional techniques. No = 0 Yes = 1

List of Variables (continued)

Number	Symbol	Variable
62	TQ62	Teacher perceives that the administrator should identify teacher's weaknesses and formulate plans for improvement with respect to helping the teacher use a variety of instructional techniques. No = 0 Yes = 1
63	TQ63	Teacher perceives that the administrator does make the teacher responsible, provides help when requested with respect to helping the teacher use a variety of instructional techniques. No = 0 Yes = 1
64	TQ64	Teacher perceives that the administrator does help the teacher identify weaknesses and work together to plan for improvement with respect to helping the teacher use a variety of instructional techniques. No = 0 Yes = 1
65	TQ65	Teacher perceives that the administrator does identify teacher's weaknesses and formulate plans for improvement with respect to helping the teacher use a variety of instructional techniques. No = 0 Yes = 1

List of Variables (continued)

Number	Symbol	Variable
66	TQ66	Teacher perceives that the administrator should make the teacher responsible, providing help when requested with respect to the teacher's handling of discipline problems. No = 0 Yes = 1
67	TQ67	Teacher perceives that the administrator should help the teacher identify weaknesses and work together to plan for improvement with respect to the teacher's handling of discipline problems. No = 0 Yes = 1
68	TQ68	Teacher perceives that the administrator should identify the teacher's weaknesses and formulate plans for improvement with respect to the teacher's handling of discipline problems. No = 0 Yes = 1
69	TQ69	Teacher perceives that the administrator does make the teacher responsible, providing help when requested with respect to the teacher's handling of discipline problems. No = 0 Yes = 1
70	TQ70	Teacher perceives that the administrator does help the teacher identify weaknesses and work together to plan for improvement with respect to the teacher's handling of discipline problems. No = 0 Yes = 1

List of Variables (continued)

Number	Symbol	Variable
71	TQ71	Teacher perceives that the administrator does identify the teacher's weaknesses and formulates plans for improvement with respect to the teacher's handling of discipline problems. No = 0 Yes = 1
72	TPCI	Teacher's pupil control ideology. Actual score ranging from 0 to 45 Most humanistic = 0 Most custodial = 45
73	LUNCH	Percent of students in school on free or reduced price lunches. 0-25 percent = 1 25-50 percent = 2 51 percent or more = 3
74	INNER	Type of community served by school: Inner city. No = 0 Yes = 1
75	SUBURB	Type of community served by school: Suburban. No = 0 Yes = 1
76	RURAL	Type of community served by school: Rural. No = 0 Yes = 1

List of Variables (continued)

Number	Symbol	Variable
77	AQ77	Administrator's perception of amount of time to be spent in lecture. Actual percent reported
78	AQ78	Administrator's perception of amount of time to be spent in question/discussion. Actual percent reported
79	AQ79	Administrator's perception of amount of time to be spent in demonstration. Actual percent reported
80	AQ80	Administrator's perception of amount of time to be spent in seatwork. Actual percent reported
81	AQ81	Administrator's perception of amount of time to be spent in laboratory activities. Actual percent reported
82	AQ82	Administrator prefers teacher to use a textbook with little modification. No = 0 Yes = 1
83	AQ83	Administrator prefers teacher to use a textbook with supplementary materials. No = 0 Yes = 1
84	AQ84	Administrator prefers teacher to use several textbooks. No = 0 Yes = 1

List of Variables (continued)

Number	Symbol	Variable
85	AQ85	Administrator prefers teacher to use teacher developed materials. No = 0 Yes = 1
86	APCI	Administrator's pupil control ideology. Actual score ranging from 0 to 45 Most humanistic = 0 Most custodial = 45
87	AQ87	Administrator feels that developing positive student attitudes toward science is the most important goal of science education. No = 0 Yes = 1
88	AQ88	Administrator feels that developing skills in the process of inquiry is the most important goal of science education. No = 0 Yes = 1
89	AQ89	Administrator feels that recognizing role of science as a part of education is the most important goal of science education. No = 0 Yes = 1
90	AQ90	Administrator feels that developing skills in use of instruments and techniques is the most important goal of science education. No = 0 Yes = 1

List of Variables (continued)

Number	Symbol	Variable
91	AQ91	Administrator feels that showing applications of science to attack societal problems is the most important goal of science education. No = 0 Yes = 1
92	AQ92	Administrator perceives encouragement he/she gives to the science teacher is that of fulfilling role expectation as defined by the school, situation, and training. No = 0 Yes = 1
93	AQ93	Administrator perceives encouragement he/she gives to the science teacher is to develop unique abilities within broad limits. No = 0 Yes = 1
94	AQ94	Administrator perceives encouragement he/she gives to the science teacher is to be free to do what teacher wants within legal boundaries. No = 0 Yes = 1
95	AQ95	Administrator perceives that he/she should make the teacher be responsible, provide help when requested with respect to the teacher's handling discipline problems. No = 0 Yes = 1

List of Variables (continued)

Number	Symbol	Variable
96	AQ96	Administrator perceives that he/she should help the teacher identify weaknesses and work together to plan for improvement with respect to the teacher's handling discipline problems. No = 0 Yes = 1
97	AQ97	Administrator perceives that he/she should identify the teacher's weaknesses and formulate plans for improvement with respect to the teacher's handling discipline problems. No = 0 Yes = 1
98	AQ98	Administrator perceives that he/she should make the teacher be responsible, provide help when requested with respect to helping the teacher use a variety of instructional techniques. No = 0 Yes = 1
99	AQ99	Administrator perceives that he/she should help the teacher identify weaknesses and work together to plan for improvement with respect to helping the teacher use a variety of instructional techniques. No = 0 Yes = 1
100	AQ100	Administrator perceives that he/she should identify the teacher's weaknesses and formulate plans for improvement with respect to helping the teacher use a variety of instructional techniques. No = 0 Yes = 1

List of Variables (continued)

Number	Symbol	Variable
101	SQA1	Student's grades in this class compared to other classes: Lowest of all grades. No = 0 Yes = 1
102	SQA2	Student's grades in this class compared to other classes: Lower than most grades. No = 0 Yes = 1
103	SQA3	Student's grades in this class compared to other classes: About the same as other grades. No = 0 Yes = 1
104	SQA4	Student's grades in this class compared to other classes: Higher than most other grades. No = 0 Yes = 1
105	SQA5	Student's grades in this class compared to other classes: Higher than any other grades. No = 0 Yes = 1
106	SQ2	Student's grades in this class. Usually E or F = 1 Usually D's = 2 Usually C's = 3 Usually B's = 4 Usually A's = 5

List of Variables (continued)

Number	Symbol	Variable
107	SQ3	Student enjoys this class. Never = 1 Rarely = 2 Sometimes = 3 Usually = 4 Always = 5
108	SQ4	Student enjoyed science before this year. Never = 1 Rarely = 2 Sometimes = 3 Usually = 4 Always = 5
109	SQ5	Student's feeling of how much learned in this class. Nothing = 1 Very little = 2 Average amount = 3 Quite a lot = 4 A great deal = 5
110	SQ6	Student's perception of whether this class increased interest in science. Definitely no = 1 Mostly no = 2 Uncertain = 3 Mostly yes = 4 Definitely yes = 5
111	SQ7	Student looking forward to taking more science classes. Definitely no = 1 Mostly no = 1 Uncertain = 3 Mostly yes = 4 Definitely yes = 5

List of Variables (continued)

Number	Symbol	Variable
112	SQ8	Student's sex. Female = 1 Male = 2
113	CASTA	CAST:PP Subscale A. Actual score: Range 5-25
114	CASTB	CAST:PP Subscale B. Actual score: Range 5-25
115	SCRALL	Student Classroom Rating (SCR). Actual score: Range 10-40.
116	SCACLA	SCACL:TP Subscale A (Student Participation). Actual score: Range 0-8
117	SCACLB	SCACL:TP Subscale B (Role of Teacher). Actual Score: Range 0-9
118	SCACLC	SCACL:TP Subscale C (Use of Texts). Actual score: Range 0-8
119	SCACLD	SCACL:TP Subscale D (Use of Tests). Actual score: Range 0-11
120	SCACLE	SCACL:TP Subscale E (Lab Preparation). Actual score: Range 0-8

List of Variables (continued)

Number	Symbol	Variable
121	SCACLF	SCACL:TP Subscale F (Type of Lab Activities). Actual score: Range 0-9
122	SCACLG	SCACL:TP Subscale G (Lab Follow-Up). Actual score: Range 0-7
123	SCACLALL	SCACL:TP Total Score. Actual score: Range 0-60

APPENDIX G

MEANS, STANDARD DEVIATIONS, AND NUMBER OF CASES FOR ALL VARIABLES

Means, Standard Deviations and Number of Cases For All Variables

		Program								
		Undergraduate			Post-Degree			Combined		
Variable Number	Symbol	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
1	AGE	27.38	3.10	21	28.13	5.57	30	27.82	4.69	51
2	PRO	1.00	0.00	21	0.00	0.00	30	0.41	0.50	51
3	BA	0.43	0.51	21	0.03	0.18	30	0.20	0.40	51
4	BAHR	0.57	0.51	21	0.67	0.48	30	0.63	0.49	51
5	MA	0.00	0.00	21	0.17	0.38	30	0.10	0.30	51
6	MAHR	0.00	0.00	21	0.13	0.35	30	0.08	0.27	51
7	GPA	3.22	0.43	20	3.39	0.36	30	3.32	0.39	50
8	RECENCY	7.76	5.73	21	3.83	3.32	30	5.45	4.83	51
9	FIELD	0.43	0.51	21	0.70	0.47	30	0.59	0.50	51
10	YREXP	3.24	1.51	21	2.17	1.12	30	2.60	1.39	51
11	YREEMP	2.24	1.30	21	2.07	1.14	30	2.13	1.20	51

Means, Standard Deviations and Number of Cases
For All Variables (continued)

Variable Number	Symbol	Undergraduate $\bar{X}$	Undergraduate S.D.	Undergraduate N	Post-Degree $\bar{X}$	Post-Degree S.D.	Post-Degree N	Combined $\bar{X}$	Combined S.D.	Combined N
12	PROSC	0.57	0.51	21	0.70	0.47	30	0.65	0.48	51
13	PRONUM	0.67	0.66	21	0.93	0.74	30	0.82	0.71	51
14	PROED	0.67	0.48	21	0.43	0.50	30	0.53	0.50	51
15	PROENUM	0.90	0.77	21	0.50	0.57	30	0.67	0.68	51
16	MEETO	0.43	0.51	21	0.53	0.51	30	0.49	0.50	51
17	MEETI	0.43	0.51	21	0.47	0.51	30	0.45	0.50	51
18	MEET2	0.10	0.30	21	0.00	0.00	30	0.04	0.20	51
19	CURRDEV	0.48	0.51	21	0.60	0.50	30	0.55	0.50	51
20	INFLA	2.43	0.68	21	2.07	0.83	30	2.22	0.78	51
21	INFLS	2.57	0.51	21	2.60	0.56	30	2.59	0.54	51
22	PREP	2.19	0.68	21	2.27	0.94	30	2.23	0.84	51

Means, Standard Deviations and Number of Cases
For All Variables (continued)

		Program								
		Undergraduate			Post-Degree			Combined		
Variable Number	Symbol	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
23	PERIOD	5.81	0.75	21	5.20	1.00	30	5.45	0.94	51
24	SIZE	4.29	1.90	21	4.07	1.48	30	4.16	1.65	51
25	BIO	0.19	0.40	21	0.40	0.50	30	0.31	0.47	51
26	CHEM	0.33	0.48	21	0.30	0.47	30	0.31	0.47	51
27	PHY	0.05	0.22	21	0.13	0.35	30	0.10	0.30	51
28	GENSC	0.29	0.46	21	0.17	0.38	30	0.22	0.41	51
29	EARTH	0.14	0.36	21	0.00	0.00	30	0.06	0.24	51
30	YRSCLASS	1.95	1.20	21	1.70	0.95	30	1.80	1.06	51
31	MOD	0.05	0.22	21	0.03	0.18	30	0.04	0.20	51
32	REG	0.81	0.40	21	0.67	0.48	30	0.72	0.45	51
33	ADV	0.14	0.36	21	0.30	0.47	30	0.23	0.43	51

Means, Standard Deviations and Number of Cases
For All Variables (continued)

		Program								
		Undergraduate			Post-Degree			Combined		
Variable Number	Symbol	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
34	LOW	0.14	0.36	21	0.20	0.41	30	0.18	0.38	51
35	AVE	0.62	0.50	21	0.50	0.51	30	0.55	0.50	51
36	HIGH	0.24	0.44	21	0.30	0.47	30	0.27	0.45	51
37	C37	2.14	0.79	21	2.53	0.73	30	2.37	0.77	51
38	C38	1.81	0.60	21	2.40	0.62	30	2.15	0.67	51
39	C39	1.81	0.75	21	2.23	0.77	30	2.06	0.78	51
40	C40	2.09	0.83	21	2.40	0.67	30	2.27	0.75	51
41	C41	2.00	0.89	21	1.87	0.73	30	1.92	0.79	51
42	C42	2.48	0.60	21	2.10	0.80	30	2.25	0.74	51
43	C43	2.19	0.81	21	2.57	0.57	30	2.41	0.70	51
44	C44	2.33	0.66	21	2.03	0.61	30	2.15	0.64	51

Means, Standard Deviations and Number of Cases
For All Variables (continued)

		Program								
		Undergraduate			Post-Degree			Combined		
Variable Number	Symbol	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
45	C45	2.57	0.60	21	2.13	0.73	30	2.31	0.71	51
46	C46	2.19	0.81	21	2.27	0.69	30	2.23	0.74	51
47	C47	2.71	0.56	21	2.27	0.69	30	2.45	0.67	51
48	C48	2.29	0.78	21	2.07	0.58	30	2.16	0.67	51
49	C49	2.71	0.56	21	2.70	0.59	30	2.71	0.58	51
50	TQ50	0.05	0.22	21	0.20	0.41	30	0.14	0.35	51
51	TQ51	0.62	0.50	21	0.67	0.48	30	0.65	0.48	51
52	TQ52	0.24	0.44	21	0.07	0.25	30	0.14	0.35	51
53	TQ53	0.09	0.30	21	0.07	0.25	30	0.08	0.27	51
54	TQ54	0.00	0.00	21	0.03	0.18	30	0.02	0.14	51
55	TQ55	0.38	0.50	21	0.63	0.49	30	0.53	0.50	51

Means, Standard Deviations and Number of Cases
For All Variables (continued)

		Program								
		Undergraduate			Post-Degree			Combined		
Variable Number	Symbol	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
56	TQ56	0.48	0.51	21	0.17	0.38	30	0.29	0.46	51
57	TQ57	0.14	0.36	21	0.17	0.38	30	0.16	0.37	51
58	TQ58	4.33	0.79	21	4.20	0.89	30	4.25	0.84	51
59	TQ59	3.28	1.19	21	3.70	1.02	30	3.53	1.10	51
60	TQ60	0.48	0.51	21	0.41	0.50	29	0.44	0.50	50
61	TQ61	0.48	0.51	21	0.59	0.50	29	0.54	0.50	50
62	TQ62	0.05	0.21	21	0.00	0.00	29	0.02	0.14	50
63	TQ63	0.81	0.40	21	0.62	0.49	29	0.70	0.46	50
64	TQ64	0.05	0.22	21	0.14	0.35	29	0.10	0.30	50
65	TQ65	0.14	0.36	21	0.24	0.43	29	0.20	0.40	50
66	TQ66	0.29	0.46	21	0.38	0.49	29	0.34	0.48	50

Means, Standard Deviations and Number of Cases
For All Variables (continued)

		Program								
		Undergraduate			Post-Degree			Combined		
Variable Number	Symbol	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
67	TQ67	0.57	0.50	21	0.48	0.51	29	0.52	0.50	50
68	TQ68	0.14	0.36	21	0.14	0.35	29	0.14	0.35	50
69	TQ69	0.71	0.46	21	0.72	0.45	29	0.72	0.45	50
70	TQ70	0.14	0.36	21	0.10	0.31	29	0.12	0.33	50
71	TQ71	0.14	0.36	21	0.17	0.38	29	0.16	0.37	50
72	TPCI	26.33	3.55	21	26.53	4.85	30	26.45	4.32	51
73	LUNCH	1.29	0.56	21	1.20	0.41	30	1.23	0.47	51
74	INNER	0.24	0.44	21	0.13	0.35	30	0.18	0.38	51
75	SUBURB	0.43	0.51	21	0.67	0.48	30	0.57	0.50	51
76	RURAL	0.33	0.48	21	0.20	0.41	30	0.25	0.44	51
77	AQ77	27.62	9.69	21	26.25	12.74	28	26.84	11.44	49

Means, Standard Deviations and Number of Cases For All Variables (continued)

		Program								
		Undergraduate			Post-Degree			Combined		
Variable Number	Symbol	X̄	S.D.	N	X̄	S.D.	N	X̄	S.D.	N
78	AQ78	18.81	6.87	21	24.04	10.39	28	21.80	9.34	49
79	AQ79	16.90	4.02	21	16.18	6.83	28	16.49	5.76	49
80	AQ80	12.85	7.17	21	9.93	5.79	28	11.18	6.51	49
81	AQ81	22.85	8.74	21	21.96	9.65	28	22.35	9.19	49
82	AQ82	0.05	0.22	21	0.00	0.00	30	0.02	0.14	51
83	AQ83	0.81	0.40	21	0.93	0.25	30	0.88	0.32	51
84	AQ84	0.09	0.30	21	0.03	0.18	30	0.06	0.24	51
85	AQ85	0.05	0.22	21	0.00	0.00	30	0.02	0.14	51
86	APCI	27.00	3.11	21	25.23	4.40	30	25.96	3.99	51
87	AQ87	0.33	0.48	21	0.20	0.41	30	0.25	0.44	51
88	AQ88	0.19	0.40	21	0.47	0.51	30	0.35	0.48	51

Means, Standard Deviations and Number of Cases
For All Variables (continued)

		Program								
		Undergraduate			Post-Degree			Combined		
Variable Number	Symbol	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
89	AQ89	0.24	0.44	21	0.03	0.18	30	0.12	0.32	51
90	AQ90	0.00	0.00	21	0.03	0.18	30	0.02	0.14	51
91	AQ91	0.24	0.44	21	0.27	0.45	30	0.25	0.44	51
92	AQ92	0.67	0.48	21	0.43	0.50	30	0.53	0.50	51
93	AQ93	0.29	0.46	21	0.50	0.51	30	0.41	0.50	51
94	AQ94	0.05	0.22	21	0.10	0.30	30	0.08	0.27	51
95	AQ95	0.14	0.36	21	0.17	0.38	30	0.15	0.37	51
96	AQ96	0.57	0.51	21	0.63	0.49	30	0.61	0.49	51
97	AQ97	0.29	0.46	21	0.20	0.41	30	0.23	0.43	51
98	AQ98	0.19	0.40	21	0.10	0.30	30	0.14	0.35	51
99	AQ99	0.43	0.51	21	0.70	0.47	30	0.59	0.50	51

Means, Standard Deviations and Number of Cases
For All Variables (continued)

		Program								
		Undergraduate			Post-Degree			Combined		
Variable Number	Symbol	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
100	AQ100	0.38	0.50	21	0.20	0.41	30	0.27	0.45	51
101	SQA1	0.08	0.11	21	0.11	0.10	30	0.09	0.11	51
102	SQA2	0.15	0.10	21	0.15	0.11	30	0.15	0.11	51
103	SQA3	0.56	0.15	21	0.56	0.14	30	0.56	0.14	51
104	SQA4	0.16	0.11	21	0.14	0.11	30	0.15	0.11	51
105	SQA5	0.08	0.08	21	0.04	0.06	30	0.06	0.70	51
106	SQ2	3.83	0.44	21	3.66	0.41	30	3.73	0.43	51
107	SQ3	3.72	0.39	21	3.53	0.48	30	3.61	0.45	51
108	SQ4	3.29	0.49	21	3.27	0.49	30	3.28	0.48	51
109	SQ5	3.61	0.49	21	3.45	0.48	30	3.52	0.48	51
110	SQ6	3.39	0.58	21	3.16	0.50	30	3.26	0.54	51

Means, Standard Deviations and Number of Cases
For All Variables (continued)

		Program								
		Undergraduate			Post-Degree			Combined		
Variable Number	Symbol	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
111	SQ7	3.30	0.50	21	3.18	0.57	30	3.23	0.54	51
112	SQ8	1.49	0.21	21	1.57	0.33	30	1.54	0.29	51
113	CASTA	19.71	1.77	21	19.30	1.92	30	19.47	1.86	51
114	CASTB	18.94	1.59	21	18.03	1.66	30	18.40	1.68	51
115	SCRALL	31.57	2.71	21	30.69	2.40	30	31.05	2.55	51
116	SCACLA	7.09	0.94	21	6.87	1.19	30	6.96	1.09	51
117	SCACLB	8.19	0.75	21	8.37	0.76	30	8.29	0.76	51
118	SCACLC	6.76	0.99	21	6.97	1.12	30	6.88	1.07	51
119	SCACLD	9.33	1.31	21	9.60	1.04	30	9.49	1.15	51
120	SCACLE	5.76	1.18	21	6.30	1.09	30	6.08	1.15	51
121	SCACLF	7.14	1.42	21	7.37	1.30	30	7.27	1.34	51

Means, Standard Deviations and Number of Cases For All Variables (continued)

		Program								
		Undergraduate			Post-Degree			Combined		
Variable Number	Symbol	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
122	SCACLG	5.67	1.15	21	5.76	1.00	30	5.72	1.06	51
123	SCACLALL	49.95	5.25	21	51.23	4.71	30	50.70	4.92	51

APPENDIX H

CORRELATION MATRIX FOR ALL VARIABLES

	AGE	PRO	BA	BAHR	MA	MAHR
AGE	1.0000					
PRO	-.0798	1.0000				
BA	-.0982	.4899**	1.0000			
BAHR	-.1690	-.0969	-.6409**	1.0000		
MA	.0125	-.2758	-.1628	-.4279**	1.0000	
MAHR	.4352**	-.2441	-.1441	-.3786*	-.0962	1.0000
GPA	.2381	-.2039	-.3115	.0337	.1184	.2680
RECENCY	-.1305	.4039*	.5725**	-.3934*	.0791	-.2256
FIELD	.0366	-.2714	-.0885	.0969	-.1261	.0959
YREXP	.2290	.3840*	.1770	-.3087	.1422	.1364
YREMP	.3064	.0710	.1092	-.3887*	.2948	.2118
PROSC	.0691	-.1324	-.0486	-.0599	.1055	.0628
PRONUM	.0144	-.1859	-.1564	-.0203	.2692	-.0304
PROED	-.0020	.2301	.1688	-.2390	.1787	-.0172
PROENUM	-.0125	.2945	.1704	-.1399	.0650	-.0719
MEETO	.0035	-.1031	.2073	-.1368	-.0595	.0057
MEET1	.0514	-.0377	-.2491	.1276	.0987	.0287
MEET2	-.1446	.2415	.1547	-.0533	-.0666	-.0589
CURRDEV	.0334	-.1225	.0506	-.1278	.1663	-.0287
INFLA	.0923	.2298	.3086	-.3089	-.0918	.2011
INFLS	.2810	-.0265	.0110	-.2159	.1316	.2264
PREP	.0565	-.0452	.0385	-.1723	.1448	.0930
PERIOD	.0409	.3207	.2371	-.1921	-.0180	.0153
SIZE	-.2259	.0658	.0432	.0986	-.1524	-.0725
BIO	-.0289	-.2222	-.1210	.1714	-.2229	.1171
CHEM	-.2291	.0354	.0918	-.1782	.2034	-.0401
PHY	.3676*	-.1419	-.1628	-.0187	.1130	.1491
GENSC	.0302	.1425	.1012	.0097	-.0126	-.1530
EARTH	-.0084	.2988	.0864	.0203	-.0824	-.0729
YRSCLASS	.2991	.1185	.1866	-.2989	.1875	.0546
MOD	-.0793	.0362	-.0998	.1557	-.0666	-.0589
BEG	.0902	.1575	.1931	-.0196	-.3882*	.1795
ADV	-.0586	-.1823	-.1575	-.0506	.4389**	-.1618
LOW	-.0046	-.0738	-.0991	.2503	-.1526	-.1350
AVE	-.1448	.1177	.1498	-.1278	-.0987	.1178
HIGH	.1653	-.0683	-.0825	-.0713	.2405	-.0160
C37	.1012	-.2509	-.3047	.0571	.1840	.1438
C38	.1291	-.4352**	-.1900	-.0012	.0213	.2591
C39	.0681	-.2683	-.1644	.1105	.0599	-.0221
C40	-.0144	-.2019	-.1160	-.0428	.1444	.0885
C41	-.0145	.0833	-.0762	.1806	-.1345	-.0635
C42	.0131	.2513	.0302	-.0086	-.0246	-.0019
C43	.1082	-.2679	.1345	-.1864	-.0056	.1428
C44	.0557	.2315	.0334	-.0648	.1257	-.0718
C45	-.0433	.3081	.2020	-.0602	-.1478	-.0266
C46	.0296	-.0514	.0438	-.0850	.1647	-.0940
C47	-.1645	.3307*	.1846	-.1480	.0738	-.0880
C48	.1228	.1614	-.0421	.0595	-.0774	.0407
C49	.0396	.0123	.1681	-.1841	.0544	.0226
TQ50	-.0339	-.2179	-.1970	.0716	.0601	.0956
TQ51	.0426	-.0490	-.0486	.0250	-.0325	.0628
TQ52	-.0339	.2452	.2336	-.1641	.0601	-.1164
TQ53	.0111	.0523	.0396	.0739	-.0962	-.0851
TQ54	-.1469	-.1183	-.0698	.1090	-.0466	-.0413
TQ55	.1080	-.2489	-.3259*	.1673	-.0855	.2750
TQ56	-.0589	.3343*	.2232	-.1257	.0766	-.1883
TQ57	-.0184	-.0322	.1944	-.1137	.0391	-.1258
TQ58	.0924	.0784	.0857	-.1531	-.0216	.1727
TQ59	.0997	-.1869	.1225	-.2208	.0213	.1927
TQ60	-.2540	.0620	-.0403	.1959	-.0269	-.2614
TQ61	.2609	-.1089	.0602	-.2265	.0401	.2722
TQ62	-.0283	.1679	-.0714	.1115	-.0476	-.0421
TQ63	-.0019	.2034	.1091	.1169	-.2182	-.1287

* - SIGNIF. LE .01   ** - SIGNIF. LE .001

	AGE	PRO	BA	BAHR	MA	MAHR
TQ64	.0776	-.1486	.0000	-.1511	.1111	.1474
TQ65	-.0561	-.1216	-.1250	-.0206	.1667	.0369
TQ66	.2399	-.0975	-.0422	.1270	-.0985	-.0560
TQ67	-.2151	.0876	.1801	-.1748	.1868	-.1594
TQ68	-.0179	.0070	-.2017	.0784	-.1345	.3059
TQ69	-.1068	-.0108	-.2450	.1542	.0594	.0197
TQ70	.2585	.0599	.2770	-.2181	-.1231	.1180
TQ71	-.0983	-.0398	.0546	.0045	.0364	-.1287
TPCI	-.0187	-.0230	-.0174	.1001	-.1271	-.0137
LUNCH	-.1884	.0901	.2793	-.0459	-.1657	-.1466
INNER	-.1818	.1352	.1600	.0375	-.1526	-.1350
SUBUR	-.1951	-.2366	-.2679	.2296	.0209	-.0404
RURAL	.3808*	.1506	.1644	-.2938	.1098	.1641
AQ77	-.2267	.0598	.0860	.0301	-.1440	-.0154
AQ78	-.1269	-.2798	-.2347	.1801	.1533	-.1547
AQ79	-.1536	.0631	-.0315	.1027	.1485	-.3004
AQ80	-.0358	.2249	.0355	.1202	-.1665	-.0779
AQ81	.5092**	.0486	.0225	-.2455	-.0129	.4147*
AQ82	.0054	.1690	-.0698	.1090	-.0466	-.0413
AQ83	.0648	-.1891	.1803	-.2814	.1204	.1065
AQ84	.0095	.1295	-.1235	.1926	-.0824	-.0729
AQ85	-.0251	.1690	-.0698	.1090	-.0466	-.0413
APCI	-.2398	.2201	.0674	.0642	-.1303	-.0710
AQ87	-.0165	.1506	.2778	-.2007	.1098	-.1706
AQ88	.0192	-.2844	-.2614	.0599	.0325	.2424
AQ89	-.0779	.3128	.1262	.0296	-.1204	-.1065
AQ90	.2490	-.1183	-.0698	.1090	-.0466	-.0413
AQ91	-.0262	-.0323	-.0622	.0785	-.0415	-.0033
AQ92	-.1543	.2301	.0698	.1673	-.2176	-.1633
AQ93	.1004	-.2143	-.1122	-.1793	.2601	.2005
AQ94	.1839	-.0959	.0396	.0739	-.0962	-.0851
AQ95	-.1810	-.0322	.0586	-.1137	.2204	-.1258
AQ96	.2636	-.0624	-.1091	.0456	-.0053	.0849
AQ97	-.1482	.0994	.0753	.0450	-.1829	.0101
AQ98	-.1567	.1294	.0900	-.0462	.0601	-.1164
AQ99	.1141	-.2714	.0118	-.1503	.0079	.2441
AQ100	-.0050	.1996	-.0825	.2014	-.0550	-.1795
SQA1	-.0683	-.1555	.1462	-.3033	.4353**	-.1521
SQA2	-.0978	.0112	.2742	-.1596	.1168	-.2470
SQA3	.0453	-.0093	-.0999	.0373	-.0317	.1155
SQA4	.2384	.0868	-.0671	.0779	-.3633*	.3608*
SQA5	-.0127	.2747	.0125	.2324	-.2732	-.1344
SQ2	.0038	.1922	-.1300	.0955	-.0089	.0301
SQ3	-.1910	.2035	-.0108	.0349	-.0072	-.0389
SQ4	-.0007	.0175	.0713	-.1660	.3145	-.1546
SQ5	-.1371	.1605	.0952	-.1664	.0980	.0502
SQ6	-.1514	.2078	-.0430	.0664	-.1206	.0776
SQ7	.0517	.1067	-.1022	-.0907	.2136	.0779
SQ8	.1830	.1499	.0983	-.0857	-.0031	.0124
CASTA	-.1947	.1119	.0514	-.1037	.1635	-.0704
CASTAAJ	-.2001	.0724	.0811	-.1270	.1693	-.0787
CASTB	-.1468	.2690	.1356	-.1984	.1064	.0388
CASTBAJ	-.1583	.2152	.1937	-.2478	.1170	.0302
SCRALL	-.2296	.1715	.0421	-.1425	.1498	.0284
SCACLA	-.1338	.1038	.1090	-.1775	.1944	-.0567
SCACLB	-.1768	-.1158	-.0621	.0860	.1347	-.2120
SCACLC	.1073	-.0951	.0082	-.1621	.1610	.1012
SCACLD	.1676	-.1147	.0474	-.1661	.2046	.0025
SCACLE	-.0271	-.2333	-.1647	.0890	.1515	-.0844
SCACLF	-.1097	-.0828	.2695	-.2679	.1799	-.1151
SCACLG	.0947	-.0469	.1292	-.1243	.1491	-.1322
SCACLALL	-.0101	-.1292	.0905	-.1794	.2631	-.1020

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	GPA	RECENCY	FIELD	YREXP	YREMP	PROSC
GPA	1.0000					
RECENCY	-.3056	1.0000				
FIELD	.1513	-.2957	1.0000			
YREXP	.0869	.3342*	-.1809	1.0000		
YREMP	.1538	.2545	.0296	.6578**	1.0000	
PROSC	.3428*	-.1104	-.1177	-.1810	-.0873	1.0000
PRONUM	.3467*	-.1447	-.0398	-.2130	-.0646	.8616**
PROED	-.2060	.3432*	.0094	.0740	.0097	-.0387
PROENUM	-.3157	.3492*	.0000	.0281	.0081	-.2426
MEET0	-.1493	.0305	.1031	.1372	.1838	-.3428*
MEET1	.1780	-.0278	.0377	-.1716	-.1710	.3395*
MEET2	-.1166	.0654	-.2415	-.0894	-.0233	.1492
CURRDEV	-.1261	.1019	.1225	.1429	.2704	-.3395*
INFLA	.0104	.1746	-.0242	.2269	.0956	-.0062
INFLS	.1800	.0886	.1767	.1013	.1207	.0455
PREP	.2234	.0517	-.1467	.2013	.1262	.2092
PERIOD	-.0210	.2480	-.0225	.2140	.1912	-.1703
SIZE	-.2639	-.2292	.0558	-.0773	-.0917	.0457
BIO	.0936	-.2756	.4798**	-.0839	-.0781	-.0312
CHEM	.0605	.1393	-.2929	-.0223	-.0425	.2341
PHY	.1699	-.2377	-.2601	.1422	.1284	-.0325
GENSC	-.1313	.2892	.0513	.0456	.0197	-.1115
EARTH	-.2961	.0635	-.1295	-.0500	.0412	-.1641
YRSCLASS	.0488	.1817	-.0045	.5324**	.6669**	-.2164
MOD	-.3006	-.1034	.1690	.0577	-.1933	-.2736
REG	.2214	-.1623	.0210	-.1117	-.1508	.0973
ADV	-.0922	.2181	-.0994	.0911	.2471	.0228
LOW	.0003	-.1511	.2828	-.0176	-.0535	-.0886
AVE	-.1261	-.1204	.0424	-.2875	-.1606	.0728
HIGH	.1425	.2633	-.2888	.3357*	.2247	-.0054
C37	.2080	-.0886	-.1132	-.0289	-.0131	.1985
C38	.2386	-.0896	-.0421	-.0184	.0717	.1735
C39	.1334	.0139	-.2442	-.0519	-.0087	.0559
C40	-.0822	.0699	-.1735	.3361*	.3348*	.0520
C41	-.2908	-.1153	-.2854	-.0647	-.2606	-.1255
C42	.0235	.0397	-.3054	.1957	.0048	.0328
C43	.1435	.1276	-.0780	-.1398	-.0449	.1432
C44	.0339	.1374	-.0441	.3165	.2820	-.0757
C45	.0787	.2446	-.1373	.2913	.1132	-.0207
C46	.0676	.0931	-.1669	.2466	.1662	-.0430
C47	-.3224	.3052	-.0915	.3863*	.2438	-.3007
C48	-.1516	.1603	.0175	.2809	.0964	-.1337
C49	-.0174	.0342	-.2219	.2283	.1174	-.1650
TQ50	.2009	.0934	-.0136	-.0105	.1457	-.0631
TQ51	-.1224	-.3161	.1324	-.1213	-.0528	.2273
TQ52	-.0674	.3076	-.2452	.2799	-.0461	.0561
TQ53	.0592	.0487	.0959	-.1291	-.0337	-.3950*
TQ54	.1022	-.0724	-.1690	-.1656	-.1353	.1044
TQ55	.0956	-.1410	.0892	-.0118	.1419	.0435
TQ56	-.1944	.1190	-.1594	.0903	-.1470	.1165
TQ57	.0736	.0720	.1418	-.0339	.0409	-.2456
TQ58	-.1516	-.0238	-.1261	.0870	-.0155	-.0202
TQ59	.0856	.0557	-.2513	.1779	.1405	.0951
TQ60	-.2480	.1003	-.3454*	-.0318	-.1193	-.0067
TQ61	.2069	-.0791	.3113	-.0376	.0229	.0602
TQ62	.1419	-.0741	.1166	.2465	.3411*	-.1905
TQ63	-.0176	.1765	-.2673	.2106	.0514	.1455
TQ64	.0550	-.1590	.1361	-.1072	.0112	-.0278
TQ65	-.0212	-.0830	.2041	-.1609	-.0673	-.1458
TQ66	.1672	-.1620	.0689	.1272	-.0256	.0985
TQ67	-.2205	.3238	-.0490	-.0480	.0956	-.0534

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	GPA	RECENCY	FIELD	YREXP	YREMP	PROSC
TQ68	.0875	-.2451	-.0235	-.1045	-.1027	-.0576
TQ69	-.1240	-.1293	-.0546	-.0013	-.1408	-.0965
TQ70	-.0316	.0893	.0503	-.0378	.1056	.0205
TQ71	.1795	.0792	.0223	.0351	.0789	.1000
TPCI	-.2237	-.0157	.0230	-.1033	-.0160	-.1618
LUNCH	-.1817	-.0649	-.0901	-.3445*	-.3400*	.0206
INNER	-.1739	-.0329	-.1352	-.1675	-.1400	-.0886
SUBUR	.1124	-.1626	.2366	-.0469	-.0327	.0195
RURAL	.0251	.2363	-.1506	.1996	.1596	.0554
AQ77	-.2267	.0909	-.2055	-.0477	-.1678	.0236
AQ78	-.1191	-.1059	.0880	-.2479	-.1522	.0025
AQ79	-.1162	-.0646	.0238	-.0826	-.0633	-.2610
AQ80	.0947	.1495	-.0201	.0393	.0933	-.2985
AQ81	.4062*	.0563	-.0032	.3573*	.2565	.1409
AQ82	.0655	-.1020	-.1690	.2464	-.0163	-.1915
AQ83	-.1871	.0344	.3128	-.2372	.0422	-.0150
AQ84	.1374	-.1280	-.1295	.2535	-.0289	.0103
AQ85	.	.3117	-.1690	.0404	.1027	.1044
APCI	-.1566	.0860	-.0991	-.1438	-.1743	.0238
AQ87	-.2126	.2645	.0323	.0687	.1217	.0554
AQ88	.2793	-.2667	.0343	-.1178	-.0853	.2020
AQ89	-.2744	.0292	-.0655	.1486	-.0422	-.2397
AQ90	.1022	.0458	.1183	-.0626	-.0163	.1044
AQ91	.0721	-.0081	-.0592	-.0296	.0082	-.1329
AQ92	-.0383	.0232	-.0704	-.0976	-.0564	.1257
AQ93	.0665	-.1454	.0524	.0939	.1380	-.0490
AQ94	-.0736	.1553	.0959	-.0229	-.1564	-.2424
AQ95	.1578	.1396	.0322	.0054	-.0044	-.0199
AQ96	.0357	-.1089	.0624	-.1417	-.0424	.1631
AQ97	-.1765	.0057	-.0994	.1584	.0526	-.1707
AQ98	.0958	.2005	-.0136	.0309	-.0461	-.1824
AQ99	.0586	-.0460	.1095	-.1519	.0631	.1324
AQ100	-.1385	-.1038	-.1103	.1437	-.0341	-.0054
SQA1	-.1245	.2188	-.2264	.0577	.2747	.0651
SQA2	-.1048	.1708	-.1103	.1653	.1615	-.2443
SQA3	.1167	-.0153	.0826	.1336	.1611	.2145
SQA4	.0918	-.3079	.1327	-.1662	-.2542	-.0279
SQA5	.0307	-.0678	.2826	.0264	-.0836	-.0345
SQ2	.1399	.0143	-.0698	.0921	-.0865	.1226
SQ3	-.0474	.0116	.0449	.1239	.1040	-.0296
SQ4	.0534	.1951	-.1663	.1988	.2615	-.0130
SQ5	-.0152	.0547	.0225	.3386*	.2541	-.0585
SQ6	-.0617	.0197	.0958	.2398	.1503	-.2193
SQ7	.0613	.0623	-.0623	.3908*	.2968	-.1171
SQ8	-.0515	-.0177	-.2656	.0171	.0608	-.1099
CASTA	-.0113	.0573	.1635	.0208	.2175	.0231
CASTAAJ	-.0413	.0556	.1827	.0011	.2416	-.0032
CASTB	.0061	.2071	.0355	.0944	.2182	-.1316
CASTBAJ	-.0454	.2159	.0642	.0662	.2656	-.1867
SCRALL	.0244	.1398	.0467	.2419	.2292	-.0360
SCACLA	.0867	.2415	-.1773	.0424	.0498	.2383
SCACLB	.2571	-.0151	.2222	-.1167	-.1776	.1257
SCACLC	.3879*	.0555	-.0177	-.0048	.0906	.1890
SCACLD	.1826	.0650	.0102	.3221	.3110	.1371
SCACLE	.2715	-.0173	-.3634*	-.1061	-.1679	.2318
SCACLF	.1962	.1654	.1727	.0053	.1995	.0599
SCACLG	.2679	.0637	.0469	.0750	.1560	.1196
SCACLALL	.3629*	.1467	-.0341	.0589	.1253	.2414

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              PRONUM     PROED      PROENUM    MEET0      MEET1      MEET2

PRONUM        1.0000
PROED         -.0687     1.0000
PROENUM       -.2464      .8712**   1.0000
MEET0         -.4772**   -.1757     -.2126     1.0000
MEET1          .4499**    .3019      .3301*    -.6887**   1.0000
MEET2          .1936     -.2143     -.1991     -.1981     -.1831     1.0000
CURRDEV       -.2266     -.1440     -.0971      .4158*    -.4457**    .1831
INFLA          .0337     -.0924     -.1247      .0308     -.0997      .2045
INFLS          .1201      .0087     -.0546      .0217      .0350     -.0336
PREP           .1712     -.0167     -.1396     -.0417     -.0670      .1860
PERIOD        -.0873      .1186      .1756      .0304     -.0999      .1186
SIZE           .0748     -.0536      .0472     -.2856      .1538      .2891
BIO           -.1303     -.2092     -.2291      .1823     -.1032     -.1366
CHEM           .2888      .2141      .0833     -.0713      .0666      .0811
PHY           -.0110     -.0655     -.1300     -.0595     -.0338     -.0666
GENSC         -.0715      .0169      .1175     -.0374      .0996     -.1059
EARTH         -.1736      .0687      .2464     -.0784     -.0591      .3788*
YRSCLASS      -.2058      .0860      .1291      .2583     -.2816     -.1549
MOD           -.2357      .1905      .0996      .2060     -.1831     -.0408
REG            .0952     -.0518      .0217     -.1000      .1160     -.1021
ADV            .0077     -.0327     -.0683      .0109     -.0383      .1261
LOW           -.1757      .0242      .0760      .2663     -.2128     -.0935
AVE            .1642      .1718      .1359     -.2148      .1879     -.0199
HIGH          -.0330     -.2123     -.2165      .0121     -.0277      .1021
C37            .2667     -.2082     -.2523     -.1697      .1251      .0336
C38            .1419     -.1315     -.1447     -.1716      .2002     -.0475
C39            .1618     -.2318     -.2237     -.1246      .0835      .1146
C40           -.0946     -.0746     -.0910      .0600     -.0697     -.0746
C41           -.1658     -.0440      .0981     -.0020     -.0598      .0201
C42            .0488     -.0470     -.0656     -.0199     -.0461      .0672
C43            .1088     -.1204     -.2517      .1536     -.0839     -.1204
C44           -.0256     -.0145     -.1061     -.1182      .0242      .1087
C45            .0327     -.1387     -.1519     -.2714      .1568      .1981
C46           -.0336     -.1804     -.2383     -.0474      .0857     -.2035
C47           -.3729*     .1665      .1596      .1016     -.0812     -.1368
C48           -.1493     -.0138      .0289     -.1129      .1412     -.0475
C49           -.1289     -.0729     -.1017      .0243     -.0163     -.0729
TQ50           .0190     -.0606     -.0562     -.0492      .0965     -.0806
TQ51           .2222     -.1209     -.1820     -.0145     -.0728      .1492
TQ52          -.0617      .2619      .2808     -.0492      .0965     -.0806
TQ53          -.3404*    -.0172      .0359      .1516     -.1178     -.0589
TQ54           .0354     -.1500     -.1394      .1442     -.1282     -.0286
TQ55          -.0131     -.0231      .0581     -.0971      .1440     -.0119
TQ56           .1614      .0913      .0636     -.1165      .0203      .0913
TQ57          -.1977     -.0254     -.1063      .2242     -.1742     -.0871
TQ58          -.0234     -.0884     -.1271      .0763     -.0877      .0592
TQ59           .0704     -.4067*    -.4251**   -.0085     -.0786      .1797
TQ60          -.0023     -.0711     -.0572     -.0452     -.0905      .2303
TQ61           .0484      .1143      .0973      .0032      .1272     -.2212
TQ62          -.1644     -.1548     -.1436      .1487     -.1319     -.0292
TQ63           .0796      .0963     -.0516     -.1572      .0788      .1336
TQ64          -.0094     -.3612*    -.3351*     .2135     -.1739     -.0680
TQ65          -.0842      .1605      .3104      .0200      .0401     -.1021
TQ66           .0036     -.2694     -.2846      .1555     -.1542     -.1465
TQ67           .0944      .2378      .2557     -.1186      .0835      .1961
TQ68          -.1408      .0254      .0204     -.0415      .0902     -.0824
TQ69          -.0950      .0500     -.0316      .0642     -.0500     -.1000
TQ70           .0069     -.0296     -.0073     -.1084      .0296      .2387
TQ71           .1103     -.0350      .0452      .0175      .0350     -.0891
TPCI          -.1294     -.0659      .0519      .1166     -.0955     -.0849
LUNCH          .0070     -.0296      .1238      .0099     -.0347      .1142

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	PRONUM	PRCED	PROENUM	MEET3	MEET1	MEET2
INNER	-.1029	.0242	.1521	.0605	-.1094	.1715
SUBUR	.0066	-.1866	-.2536	-.0171	.1529	-.2320
RURAL	.0825	.1909	.1552	-.0335	-.0780	.1136
AQ77	-.0091	-.2159	-.1664	.0033	-.1464	.1487
AQ78	-.0123	.0067	-.0035	.1541	-.0644	-.0959
AQ79	-.1380	.1784	.2349	-.1631	.1241	.0366
AQ80	-.2264	.0830	.1627	-.0976	.1207	-.0379
AQ81	.0686	.0525	.0173	-.0284	.0603	-.0532
AQ82	-.1650	-.1500	-.1394	-.1387	-.1282	-.0286
AQ83	.0811	.2654	.2699	.1146	-.0360	.0738
AQ84	-.0556	-.0982	-.1232	-.0784	.1084	-.0505
AQ85	.0354	-.1500	-.1394	-.1387	.1560	-.0286
APCI	.1311	.3486*	.2960	-.2881	.2584	.0787
AQ87	.0187	.1607	.2217	-.1235	.1933	-.1182
AQ88	.1265	-.2079	-.3033	.0145	-.0922	.2736
AQ89	-.1674	.1004	.0900	.0072	-.0863	-.0738
AQ90	.2357	.1333	.0697	-.1387	.1560	-.0286
AQ91	-.1087	.0106	.0222	.1465	-.0780	-.1182
AQ92	.1539	-.1606	-.0581	-.1757	.2229	-.0119
AQ93	-.1295	.0704	.0000	.1363	-.1978	.0362
AQ94	-.1337	.1289	.1438	.1516	-.1178	-.0589
AQ95	-.0449	.1906	.0531	.2242	-.1742	-.0871
AQ96	.2544	-.1136	.0198	-.2568	.2437	-.0446
AQ97	-.2542	-.0327	-.0683	.1033	-.1311	.1261
AQ98	-.1425	.2619	.1966	.0648	-.0180	-.0806
AQ99	.1295	-.3099	-.2356	.0234	-.0424	.1690
AQ100	-.0330	.1398	.1083	-.0758	.0606	-.1243
SQA1	-.0054	.2612	.1725	.2812	-.2060	-.1054
SQA2	-.2581	-.1039	-.0425	.2310	-.2875	-.0116
SQA3	.3076	-.0730	-.1464	-.2358	.2438	-.0237
SQA4	-.1022	.0578	.1064	-.0181	.0232	.0218
SQA5	-.0587	-.1038	-.0356	-.0097	-.0141	.1450
SQ2	.1892	-.2179	-.2307	-.3137	.1843	.2476
SQ3	-.0007	.0818	-.0344	.0747	-.0724	.0631
SQ4	.0648	-.1036	-.1584	-.0415	-.0367	.0711
SQ5	-.0024	.0347	.0363	.0048	-.0416	.0558
SQ6	-.1181	.0631	.1275	-.1109	.0986	-.0026
SQ7	-.0474	-.0764	-.0736	-.0280	-.0235	.0070
SQ8	.0449	.1101	.1781	-.1185	.0900	.1315
CASTA	.1152	.1272	.0153	.0381	-.0017	.1244
CASTAAJ	.0764	.1779	.0662	.1078	-.0421	.0731
CASTB	-.0395	.1677	.1669	-.1558	.0904	.2427
CASTBAJ	-.1133	.2610	.2649	-.0486	.0274	.1663
SCBALL	.1123	.0751	.0613	-.0914	.0506	.0357
SCACLA	.2985	.1471	-.0713	-.0369	-.0036	.1937
SCACLB	.2095	-.1019	-.2323	-.0185	-.0929	.1905
SCACLC	.2605	.1548	-.0820	.0718	-.0481	.0224
SCACLD	.2285	-.0081	-.2196	-.0430	.0250	.0017
SCACLE	.2620	-.1771	-.2469	-.0332	-.0279	.0750
SCACLF	.0307	.0174	-.0727	.0631	-.1278	.1862
SCACLG	.1199	.0529	-.0460	.0696	-.1009	.1491
SCACLALL	.3037	.0237	-.2079	.0189	-.0826	.1778

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	CURRDEV	INFLA	INFLS	PREP	PERIOD	SIZE
CURRDEV	1.0000					
INFLA	.4048*	1.0000				
INFLS	.1879	.4068*	1.0000			
PREP	.0195	.1953	.0419	1.0000		
PERIOD	.1842	.1634	.2952	.2672	1.0000	
SIZE	-.0816	-.0576	-.1739	-.0127	-.0334	1.0000
BIO	-.0666	-.0246	-.1125	-.0898	-.1453	.1159
CHEM	.0183	.0299	-.0328	.0629	-.1001	-.1164
PHY	-.0987	-.1768	-.1170	.1448	.1230	-.0719
GENSC	-.0038	.0386	.3172	-.0339	.2059	-.0211
EARTH	.2266	.1455	-.1201	-.0708	-.0314	.1287
YRSCLASS	.2064	-.0445	-.0394	.0755	.2701	-.0735
MOD	.1831	.0741	-.2240	-.0572	-.0974	-.0194
REG	-.2043	.0578	.0195	-.1432	.1556	.1126
ADV	.1311	-.0947	.0820	.1768	-.1192	-.1096
LOW	.1094	-.2616	-.1255	-.0073	.0517	.0185
AVE	-.1879	.0489	.0393	-.1703	-.0264	.2553
HIGH	.1160	.1690	.0633	.1961	-.0147	-.3004
C37	-.0736	.0298	.0880	-.0453	-.1524	-.2029
C38	-.0821	.1241	.0163	.0042	-.1446	-.0584
C39	.0179	.0766	-.0839	-.1125	-.2252	-.1305
C40	-.0364	-.0688	-.2604	-.1047	-.3474*	-.0032
C41	-.1402	-.2933	-.3117	-.3612*	-.2711	.0551
C42	-.2213	.0754	-.0826	-.1621	-.1383	.1131
C43	.0268	.2603	.0881	.1045	-.0446	-.5943**
C44	.2229	.2489	-.0409	.0784	.1444	-.1174
C45	.1248	.5260**	.0839	.1091	.1133	.1453
C46	.0222	.0143	-.2561	-.0266	-.2990	-.0801
C47	.0812	.1534	.0261	-.0146	.1771	-.1907
C48	.1539	.3135	.0716	-.0312	-.1446	.1389
C49	.0163	.2766	-.0762	-.1023	-.2659	.2174
TQ50	-.0965	-.1845	-.1200	-.2502	-.2532	-.0730
TQ51	.0728	.0997	-.1092	.1104	.0490	.2712
TQ52	-.2111	-.1110	.0948	.1614	.0514	-.1426
TQ53	.2644	.2011	.2264	-.0827	.1712	-.2061
TQ54	.1282	-.0394	-.1568	-.0401	-.2194	-.0135
TQ55	.0139	-.0924	-.2134	-.2532	-.1754	.0903
TQ56	-.1933	-.0686	.0954	.1798	.2408	.0433
TQ57	.1742	.2278	.2332	.1375	.0226	-.1730
TQ58	.0877	.3992*	.1482	-.0863	-.0968	.1140
TQ59	.1147	.3752*	.1734	.0573	-.2147	.1401
TQ60	.0097	.1113	-.0152	-.0135	-.2430	.0361
TQ61	.0338	-.0482	.0607	-.0230	.2198	-.0320
TQ62	-.1548	-.2229	-.1620	.1295	.0806	-.0138
TQ63	-.1664	.1284	-.1650	.2395	.1042	.1425
TQ64	.0401	.0767	.1260	-.1750	-.1736	-.1129
TQ65	.1605	-.2046	.0945	-.1432	.0108	-.0786
TQ66	.1542	.1760	.0638	.1471	.0385	-.0439
TQ67	-.0032	-.0880	-.1210	-.1548	-.0208	.0203
TQ68	-.2059	-.1135	.0871	.0220	-.0225	.0307
TQ69	.0500	.0615	-.0505	.2317	-.0619	.0334
TQ70	-.1531	.1322	.0465	-.0323	-.1255	.0015
TQ71	.0744	-.1925	.0206	-.2552	.1870	-.0422
TPCI	.1139	-.1239	.1508	-.0519	.0227	.0878
LUNCH	-.1337	-.1399	-.2415	.0089	.0263	.1821
INNER	-.0973	-.2616	-.3194	-.0073	-.0032	.2069
SUBUR	-.0733	-.0130	.1449	-.1823	-.1303	-.0375
RURAL	.1684	.2436	.1147	.2135	.1509	-.1385
AQ77	-.2085	.0499	-.3757*	.2638	-.1242	-.0950
AQ78	.1164	-.0646	.0525	-.2944	.1943	.0880

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	CURRDEV	INFLA	INFLS	PREP	PERIOD	SIZE
AQ79	.0665	-.3065	-.0249	-.0059	-.0369	.3625*
AQ80	.0141	-.0965	-.1786	.0103	-.0602	-.1412
AQ81	-.0046	.3056	.3957*	-.0014	.1025	-.2308
AQ82	-.1560	-.0394	-.1568	.1302	.0830	.0728
AQ83	.1583	-.0554	-.0540	.0362	.1760	-.0394
AQ84	-.1084	.1455	.1940	-.0708	-.2096	.0269
AQ85	-.1560	-.0394	.1098	-.0401	.0830	-.0135
APCI	-.1087	-.1317	-.1574	-.0091	.1427	.0434
AQ87	-.1028	-.1628	.1147	-.0032	.0547	.1913
AQ88	.1746	.1121	.2639	.0872	-.0052	.0295
AQ89	.0863	.2125	-.0607	-.1767	.2794	-.1093
AQ90	-.1560	.1431	.1098	.1302	-.0682	-.0999
AQ91	-.1028	-.1628	-.3941*	-.0032	-.2339	-.1110
AQ92	-.0650	-.0924	.0087	-.2059	-.0074	-.0296
AQ93	.0377	.0242	-.0265	.1467	.0651	.1875
AQ94	.1178	.0129	.0890	.0052	-.0627	-.2506
AQ95	.0659	.0687	.1315	.0726	-.0350	-.3706*
AQ96	-.0823	.0163	.2093	-.1109	.1296	.1260
AQ97	.0383	-.0547	-.3537*	.0655	-.1192	.1727
AQ98	.1325	.1831	.2022	-.0444	.1732	-.2122
AQ99	.2025	.0786	.2518	-.1467	.0200	-.0658
AQ100	-.3255*	-.2279	-.4336**	.1961	-.1556	.2362
SQA1	.3171	-.0928	.0609	.0342	.0027	-.1276
SQA2	.3101	-.0244	-.0316	.0967	.0556	.0106
SQA3	-.1406	.0519	.2180	.1206	-.0380	-.0053
SQA4	-.2366	.0415	-.0671	-.1783	.0956	.1531
SQA5	-.0613	.1978	-.1514	.0364	-.0106	.1040
SQ2	-.2215	.2485	.0401	.1799	.1079	-.1599
SQ3	-.1031	.2418	.0087	.0779	.1062	-.1567
SQ4	-.0369	-.1357	-.0469	.1928	.0457	-.0657
SQ5	.0499	.2698	.0904	.1818	.3631*	-.0836
SQ6	-.0727	.1540	.0133	-.0212	.3152	-.0435
SQ7	-.0643	.1295	.1139	.2072	.2601	-.1925
SQ8	-.0763	.0712	.2721	-.0536	.2956	.0540
CASTA	-.0005	.1315	.0914	-.0299	.2090	-.1066
CASTAAJ	.0481	.0601	.0847	-.0700	.1903	-.0740
CASTB	-.0168	.3237	.1798	.1017	.1528	-.2208
CASTBAJ	.0652	.2526	.1771	.0411	.1227	-.1758
SCRALL	.1167	.2379	.1152	-.0258	.3288*	-.1057
SCACLA	-.1419	.1034	-.0963	.0320	-.0406	-.2838
SCACLB	-.0650	-.0417	.0087	.0148	-.1614	-.0696
SCACLC	.0109	.1980	.1579	.1651	.1128	-.3735*
SCACLD	-.0594	-.0529	-.1197	.1882	-.0234	-.1457
SCACLE	-.0415	.1591	-.2069	.2301	-.1257	-.3865*
SCACLF	.0389	-.0004	-.1455	.0303	-.1626	.0162
SCACLG	.0633	.0246	-.2383	.0741	-.0537	-.3059
SCACLALL	-.0385	.0894	-.1528	.1671	-.0998	-.3402*

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	BIO	CHEM	PHY	GENSC	EARTH	TRSCLASS
BIO	1.0000					
CHEM	-.4571**	1.0000				
PHY	-.2229	-.2229	1.0000			
GENSC	-.3546*	-.3546*	-.1729	1.0000		
EARTH	-.1690	-.1690	-.0824	-.1311	1.0000	
TRSCLASS	-.1557	.0055	.3133	-.0383	-.0327	1.0000
MOD	.0811	.0611	-.0666	-.1059	-.0505	-.1549
REG	-.0576	.1318	.0550	-.1047	-.0330	.1364
ADV	.0234	-.1758	-.0274	.1587	.0578	-.0726
LOW	.1304	-.0913	.0203	.0074	-.1157	-.0115
AVE	-.0666	.1882	-.0987	-.0996	.0591	.0184
HIGH	-.0371	-.1318	.0927	.1047	.0330	-.0107
C37	.0573	.1125	.2701	-.3173	-.1216	.0177
C38	.0943	.1576	.1200	-.1946	-.3083	.0719
C39	-.0512	.3293*	.1447	-.2850	-.2333	.0142
C40	.0346	.0346	.2332	-.1937	-.0924	.2957
C41	-.0936	.0137	.0328	-.1293	.3420*	-.1135
C42	-.0619	-.1192	.0649	.1421	.0266	.1155
C43	-.0360	.0252	.0898	-.0365	-.0284	-.1051
C44	.0967	-.0338	.0223	-.2037	.1998	.1633
C45	-.0012	.1196	-.1478	-.0988	.1261	.0037
C46	.0715	.1294	.0744	-.2343	-.0806	.1115
C47	-.0137	-.0137	-.0252	-.0668	.2061	.2390
C48	-.0323	-.0955	-.1762	.0910	.3156	-.0961
C49	-.0218	-.0959	.1700	-.0639	.1289	.1331
TQ50	.0987	-.1469	.0601	.0679	-.0997	-.0341
TQ51	.0572	.0572	.1055	-.2113	.0103	.0184
TQ52	-.1469	.2215	-.1315	.0679	-.0997	.0203
TQ53	-.0401	-.1972	-.0962	.2017	.2370	-.0150
TQ54	-.0956	.2092	-.0466	-.0742	-.0354	-.1085
TQ55	.2141	-.2092	.0466	-.1742	.2357	.0860
TQ56	-.2510	.2128	.0766	.0803	-.1614	.0386
TQ57	.0570	-.0592	-.1422	.1671	-.1078	-.1251
TQ58	.1981	-.0545	.0572	-.3308*	.2227	-.0324
TQ59	.0205	-.0182	.0818	.0077	-.1213	.0393
TQ60	-.0898	-.0528	.1074	.0156	.1154	-.1547
TQ61	.0310	.0768	-.0936	.0058	-.1048	.0709
TQ62	.2082	-.0935	-.0476	-.0759	-.0361	.2959
TQ63	.1684	-.0476	.2182	-.1791	-.2021	.0539
TQ64	.0572	-.0727	-.1111	.1448	-.0842	-.1964
TQ65	-.2358	.1091	-.1667	.0966	.2948	.0855
TQ66	.2317	-.1935	.1830	-.0754	-.1813	.1629
TQ67	-.1991	.1922	-.0801	.0271	.0742	-.0502
TQ68	-.0297	-.0126	-.1345	.0640	.1408	-.1501
TQ69	.2368	-.0778	.0594	-.2065	-.0300	.0203
TQ70	.0106	-.1074	.0821	-.0475	.1659	-.1708
TQ71	-.2994	.1905	-.1455	.2950	-.1103	.1265
TPCI	-.2687	-.0515	-.1426	.3902*	.1294	-.0546
LUNCH	-.2496	.1115	-.0249	.2456	-.1257	-.2256
INNER	-.2021	.2413	-.1526	.1324	-.1157	-.0606
SUBUR	.2476	-.1790	.0209	.0717	-.2870	-.2007
RURAL	-.1046	-.0076	.1098	-.1973	.4274**	.2811
AQ77	-.1273	.1073	.0942	-.1304	.1465	-.0196
AQ78	.3261	-.1770	-.1530	.0013	-.0957	-.1819
AQ79	-.1737	.0206	.0657	.0739	.0826	.0298
AQ80	-.1907	.0841	-.1874	.1289	.2173	.1062
AQ81	.1450	-.1470	.0983	.0763	-.2530	.1227
AQ82	-.0956	-.0956	.4290**	-.0742	-.0354	.2963
AQ83	.1157	-.0154	-.0843	-.1044	.0913	.1059
AQ84	.0106	.0106	-.0824	.0715	-.0625	-.1917

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	BIO	CHEM	PHY	GENSC	EARTH	TRSCLASS
AQ85	-.0956	-.0556	-.0466	.2697	-.0354	-.1085
APCI	-.3142	.2420	-.0301	.0414	.1080	.0076
AQ87	-.2015	-.1046	-.0415	.4590**	-.1462	.1094
AQ88	.0312	.0312	.0325	-.0880	-.0103	-.0967
AQ89	.0154	.0154	.0843	-.1915	.1674	.1264
AQ90	-.0956	-.0956	-.0466	.2697	-.0354	.0265
AQ91	.1863	.0894	-.0415	-.3067	.0450	-.1052
AQ92	-.1245	-.0398	-.0855	.3034	-.0982	-.2138
AQ93	.2071	-.0505	.1261	-.3419*	.1295	.2325
AQ94	-.1972	.1171	-.0962	.2017	-.0729	-.0150
AQ95	.0570	.0570	.0391	-.0951	-.1078	.0807
AQ96	-.0628	-.0628	.1298	.0306	.0301	.0796
AQ97	.0234	.0234	-.1829	.0463	.0578	-.1608
AQ98	-.0241	-.0241	.0601	.0679	-.0997	.0746
AQ99	-.0354	.1364	-.1261	-.0456	.0398	-.1185
AQ100	.0576	-.1318	.0927	-.0021	.0330	.0731
SQA1	-.2136	.3781*	.0945	-.2466	-.0129	.3243
SQA2	-.1681	.2403	.0411	-.0870	-.0422	.4510**
SQA3	-.1272	.0164	.0477	.2001	-.1916	-.0734
SQA4	.1798	-.2360	-.0239	.0394	.0721	-.2583
SQA5	.4851**	-.4047*	-.2344	-.0976	.3082	-.1755
SQ2	.0298	-.1101	-.0400	.0851	.0602	-.2823
SQ3	-.0618	.1640	-.3302*	.1159	.0131	.0582
SQ4	-.3233	.1415	.2050	.0510	.0102	.2098
SQ5	-.0161	.0986	-.2325	.0703	.0082	.2842
SQ6	-.0479	.0464	-.2554	.1749	.0200	.1171
SQ7	-.1179	-.0080	.0665	.0669	.0474	.2507
SQ8	.2051	-.1916	-.1407	.0679	.0324	.0603
CASTA	-.0322	.3129	-.4179*	.0505	-.1137	.0335
CASTAAJ	-.0394	.3443*	-.4189*	.0330	-.1295	.0961
CASTB	-.0626	.2579	-.3381*	-.0385	.1098	.0252
CASTBAJ	-.0781	.3168	-.3462*	-.0731	.0946	.1329
SCRALL	-.1589	.3658*	-.2112	-.0266	-.0947	.2891
SCACLA	-.0925	.2974	.0119	-.2449	.0090	-.1103
SCACLB	.1859	.0166	-.1295	-.0787	-.0982	-.3013
SCACLC	-.0844	.3940*	.0366	-.2117	-.2867	.1557
SCACLD	.0797	.1535	.2046	-.1414	-.4713**	.2764
SCACLE	-.0840	.1394	.1515	-.1203	-.0907	-.2013
SCACLF	.2736	.0511	-.1177	-.2158	-.1143	.1652
SCACLG	.0963	.0158	.0234	-.1808	.0654	.1650
SCACLALL	.0840	.2399	.0469	-.2712	-.2240	.0616

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	MOD	REG	ADV	LOW	AVE	HIGH
MOD	1.0000					
REG	-.3284*	1.0000				
ADV	-.1121	-.9018**	1.0000			
LOW	.4364**	-.0610	-.1355	1.0000		
AVE	-.2229	.5021**	-.4262**	-.5108**	1.0000	
HIGH	-.1243	-.5077**	.5910**	-.2847	-.6787**	1.0000
C37	-.0983	.1271	-.0887	-.2252	.0807	.1024
C38	-.0475	.1445	-.1303	-.0317	-.0821	.1187
C39	-.0153	.1596	-.1609	-.1012	.0179	.0665
C40	.0613	-.1867	.1683	.1059	-.3016	.2458
C41	.0201	-.0055	-.0034	-.0844	.0098	.0612
C42	-.0699	-.0257	.0590	-.4394**	.1531	.2046
C43	-.1204	.0486	.0039	-.2014	-.0302	.2057
C44	-.0497	-.1243	.1535	-.2751	-.1478	.3998*
C45	-.0906	.0246	.0155	-.4280**	.0121	.3521*
C46	-.0651	-.2231	.2645	-.3605*	-.1397	.4638**
C47	.0149	-.3751*	.3878*	-.2362	-.0963	.3091
C48	.1038	-.2503	.2158	-.1858	-.2002	.3819*
C49	-.0729	.1450	-.1192	-.3024	.0854	.1631
TQ50	-.0806	-.1377	.1817	-.0352	-.0965	.1377
TQ51	.1492	.1893	-.2674	.0190	.2377	-.2812
TQ52	-.0806	-.1377	.1817	.1143	-.2111	.1377
TQ53	-.0589	.0160	.0101	-.1350	-.0287	.1474
TQ54	-.0286	.0670	-.0784	.3055	-.1560	-.0870
TQ55	-.0119	.1243	-.1253	.0242	.0139	-.0362
TQ56	-.1304	.0113	.0477	-.0730	.1526	-.1078
TQ57	.1906	-.2179	.1421	-.0582	-.1508	.2179
TQ58	-.0616	-.0227	.0520	-.2640	.1349	.0752
TQ59	-.1906	-.0237	.1122	-.2718	-.0659	.3056
TQ60	.0247	-.2548	.2566	-.0571	-.1071	.1651
TQ61	-.0164	.2288	-.2330	-.0350	.1520	-.1394
TQ62	-.0292	.0691	-.0803	.3273	-.1612	-.0891
TQ63	-.0891	-.0194	.0613	-.0714	-.1407	.2138
TQ64	-.0680	-.0891	.1249	-.1455	.1612	-.0594
TQ65	.1531	.0691	-.1639	.1909	.0403	-.2004
TQ66	-.1465	.0715	-.0079	.0322	-.2143	.2106
TQ67	.1961	-.0642	-.0225	-.0175	.1161	-.1141
TQ68	-.0824	-.0051	.0432	-.0189	.1254	-.1232
TQ69	.1273	-.1905	.1418	-.0923	-.0144	.0913
TQ70	-.0754	.0932	-.0634	.0067	.0794	-.0932
TQ71	-.0891	.1507	-.1175	.1071	-.0528	-.0292
TPCI	-.0921	.0648	-.0260	-.0608	.0955	-.0545
LUNCH	.1142	.1215	-.1801	.3167	.0347	-.3092
INNER	.1715	.1695	-.2568	.4603**	-.0973	-.2847
SUBUR	-.0280	-.1809	.2031	-.2199	.0062	.1809
RURAL	-.1182	.0573	-.0062	-.1527	.0780	.0435
AQ77	.1487	-.1767	.1172	-.0537	-.0461	.0969
AQ78	.0715	-.1948	.1717	.0789	-.1845	.1362
AQ79	-.0539	.0861	-.0656	.2460	.1526	-.3795*
AQ80	-.1179	.3615*	-.3255	-.0053	.1537	-.1652
AQ81	-.1099	-.0355	.0878	-.2093	-.0945	.2838
AQ82	-.0286	.0870	-.0784	-.0655	.1282	-.0870
AQ83	.0738	.1645	-.2279	.0094	.2806	-.3209
AQ84	-.0505	-.2197	.2542	-.1157	-.2758	.4064*
AQ85	-.0286	-.2299	.2550	-.0655	-.1560	.2299
APCI	.1299	.3164	-.3923*	.1608	.2304	-.3943*
AQ87	-.1182	.0573	-.0062	.0833	.0780	-.1581
AQ88	-.1492	-.1693	.2674	-.1266	-.1552	.2812
AQ89	.2398	.0882	-.2025	-.0094	.2086	-.2246
AQ90	-.0286	.0870	-.0784	-.0655	.1282	-.0870

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	BOD	REG	ADV	LOW	AVE	HIGH
AQ91	.1136	.0573	-.1123	.0833	-.1028	.0435
AQ92	-.2143	.1243	-.0327	.1273	.0929	-.2123
AQ93	.0362	-.1103	.0994	-.1783	-.0424	.1996
AQ94	.3168	.0160	-.1618	.2476	-.1753	-.0160
AQ95	-.0871	-.0971	.1421	-.0582	-.0425	.0971
AQ96	-.2515	.1359	-.0278	-.1549	.1598	-.0459
AQ97	.3642*	-.0731	-.0897	.2282	-.1475	-.0305
AQ98	-.0806	.1177	-.0869	-.0352	.0180	.0100
AQ99	-.0362	-.0683	.0884	.0738	-.1978	.1575
AQ100	.1021	-.0154	-.0305	-.0542	.2043	-.1815
SQA1	-.1148	-.2160	.2798	.0051	.0505	-.0606
SQA2	-.1469	.0184	.0479	-.2307	.1329	.0489
SQA3	-.0809	-.0665	.1280	-.0707	-.1490	.2265
SQA4	.2133	.3382*	-.4535**	.1707	.0942	-.2509
SQA5	.1896	-.0079	-.0785	.1011	-.0671	-.0115
SQ2	.1283	-.2971	.2539	-.1437	-.3146	.4736**
SQ3	.1755	-.0942	.0188	-.1246	-.0592	.1725
SQ4	-.3062	-.2621	.4159*	-.2160	-.1596	.3624*
SQ5	-.0707	.0227	.0085	-.1997	-.0160	.1884
SQ6	.0537	.0568	-.0844	-.0872	-.0287	.1065
SQ7	-.1432	-.2172	.2941	-.2755	-.2034	.4622**
SQ8	-.0090	.0425	-.0407	-.1725	.1977	-.0731
CASTA	.1189	-.1181	.0699	-.1237	.0789	.0177
CASTAAJ	.0936	-.0558	.0159	-.0951	.1497	-.0857
CASTB	-.0552	-.1863	.2213	-.2550	.0543	.1572
CASTBAJ	-.1071	-.0875	.1411	-.2184	.1762	-.0099
SCBALL	-.0725	.1982	-.1753	-.1611	.1057	.0197
SCACLA	.1005	-.1033	.0627	-.0307	-.1055	.1439
SCACLB	.0556	-.1692	.1525	.0929	-.0650	-.0069
SCACLC	.1177	.0146	-.0693	.0029	-.0634	.0683
SCACLD	.0900	-.1973	.1664	-.1084	-.0594	.1589
SCACLE	.0750	-.1511	.1246	.0133	-.2846	.3059
SCACLF	-.1177	-.0713	.1288	.0592	-.1093	.0713
SCACLG	.1491	.0066	-.0751	.0721	-.1620	.1190
SCACLALL	.0950	-.1451	.1092	.0174	-.1919	.1991

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	C37	C38	C39	C40	C41	C42
C37	1.0000					
C38	.4224*	1.0000				
C39	.6547**	.6998**	1.0000			
C40	.3715*	.4664**	.3794*	1.0000		
C41	.0809	-.1629	.0395	.0368	1.0000	
C42	.0054	-.1610	-.0262	.0154	.2708	1.0000
C43	.1918	.2424	.2104	.0090	.0593	-.0906
C44	-.0394	-.0117	-.1372	.0333	-.0925	-.0016
C45	.0014	-.0214	.0021	-.0525	-.0620	.1491
C46	.1939	.0450	.0793	.2424	.1343	.2166
C47	-.1371	-.1150	-.2406	.1857	.1047	.0454
C48	.0008	-.0991	-.1688	.0318	.2096	.1180
C49	-.0185	.1211	.1275	.1905	.0359	.5051**
TQ50	.2523	.0770	.1897	.2361	.0397	.2487
TQ51	.1985	.1120	.1087	-.0032	-.0735	-.1343
TQ52	-.2684	-.0084	-.1035	.0060	.1120	-.0607
TQ53	-.3323*	-.2869	-.3035	-.3041	-.0635	-.0019
TQ54	.1158	-.0332	.1712	.1381	.1935	-.0489
TQ55	.2021	.2215	.1219	.3483*	.0059	.1129
TQ56	-.0330	-.2161	-.1042	-.1806	.1734	-.0481
TQ57	-.2802	-.0206	-.1020	-.3045	-.2991	-.0760
TQ58	.2496	-.0014	.1579	.0767	.2980	.3082
TQ59	.3036	.4243**	.4025*	.2561	.0255	.2468
TQ60	.0042	-.0909	-.0458	.0694	.1135	.1236
TQ61	.0146	.1000	.0477	-.1091	-.0668	-.1091
TQ62	-.0669	-.0339	-.0074	.1422	-.1646	-.0500
TQ63	.0227	.0906	.0903	.1703	-.1397	-.0059
TQ64	.0174	-.0791	.0689	-.1166	.0427	.1525
TQ65	-.0390	-.0445	-.1551	-.1076	.1280	-.1076
TQ66	.1582	.1428	.0720	.1466	.1460	-.1375
TQ67	-.0188	-.0095	.1532	.0129	-.1743	.0668
TQ68	-.1890	-.1813	-.3189	-.2187	.0517	.0915
TQ69	.1762	-.1163	-.0829	.0384	.0342	-.0216
TQ70	-.0128	.0950	.1400	.0364	-.0315	-.0464
TQ71	-.2045	.0583	-.0226	-.0793	-.0140	.0675
TPCI	-.2426	-.3608*	-.3733*	-.1129	.0918	-.1483
LUNCH	-.2992	-.0553	.0158	-.1857	.0500	-.0602
INNER	-.2252	-.0317	.0973	.0366	.1113	-.1601
SUBUR	.1652	.0860	-.0359	.0554	-.0867	-.0211
RURAL	.0092	-.0700	-.0443	-.0950	.0011	.1640
AQ77	.1491	.1066	.1480	.2248	.3296	.0278
AQ78	.0644	.1248	-.0109	-.0209	.0629	.0448
AQ79	-.3362*	-.3314	-.1560	-.2031	-.1107	-.1804
AQ80	-.0909	-.0438	.1516	-.0987	-.0214	-.1639
AQ81	.1022	.1393	.0369	-.0827	-.1459	.2625
AQ82	.1158	-.0332	-.0107	.1381	.1935	.1430
AQ83	-.0608	-.0054	-.0507	-.2746	-.1135	-.2041
AQ84	-.1216	.0661	-.0189	.1319	.0249	.1397
AQ85	.1158	-.0332	-.0107	.1381	-.1653	.1430
AFCI	-.0341	.0246	.0454	-.1366	.0368	-.2189
AQ87	-.1083	-.2721	-.2758	.0867	-.1130	-.1413
AQ88	-.0378	.1952	-.0031	.0032	-.0306	.1343
AQ89	-.0187	-.2680	-.1059	-.1349	.0363	-.0437
AQ90	.1158	.1785	.1712	-.0522	-.1653	.1430
AQ91	.1267	.1595	.3030	.0261	.1724	-.0192
AQ92	-.2082	-.2491	-.0803	-.1275	.0059	-.0470
AQ93	.1132	.1614	-.0633	.1199	.0327	.0891
AQ94	.1438	.1499	.2594	-.0096	.0290	-.1999
AQ95	.1422	-.1013	.0367	-.0142	-.0255	-.0760
AQ96	.1809	.1285	.0091	-.0816	-.0799	.1689

* - SIGNIF. LE .01   ** - SIGNIF. LE .001

	C37	C38	C39	C40	C41	C42
AQ97	-.3301*	-.0611	-.0420	.1061	.1138	-.1292
AQ98	.1036	-.0084	.1164	-.0707	-.1049	-.0607
AQ99	.0428	.1369	.0121	.0410	-.0833	-.0350
AQ100	-.1271	-.1445	-.1031	.0093	.1727	.0854
SQA1	-.0323	-.0149	-.0395	.1196	-.1188	-.1329
SQA2	-.0487	-.0584	.0307	-.0312	.0652	.0706
SQA3	.0852	.1645	.0670	.2351	-.1028	-.1207
SQA4	-.0607	-.0966	-.1649	-.2150	.1285	.1070
SQA5	-.0110	-.1601	-.0961	-.0497	-.1447	.1248
SQ2	.0668	.0381	.0123	.0537	-.0338	.1253
SQ3	-.1816	-.0247	-.1252	.0566	-.1363	.1169
SQ4	-.0758	-.0697	.0031	.1520	-.0660	.0196
SQ5	-.2104	-.0271	-.2135	.0305	-.1574	.0373
SQ6	-.2036	.0079	-.1252	.0640	-.0542	-.0168
SQ7	-.0950	-.0191	-.0935	.1599	-.0450	.0540
SQ8	-.1773	.0202	-.1305	-.3191	-.2205	.0356
CASTA	-.2244	.0520	-.0358	-.0885	-.2400	-.0535
CASTAAJ	-.2443	.0448	-.0393	-.1023	-.2382	-.0822
CASTB	-.1121	.0489	.0029	-.0358	-.1809	.0392
CASTBAJ	-.1448	.0380	-.0016	-.0584	-.1806	-.0051
SCRALL	.1032	.0601	.0704	.1008	-.1133	.0463
SCACLA	.2301	.1439	.2587	.0621	.0193	.1107
SCACLB	.0825	-.0531	.0713	-.0746	.0059	-.0648
SCACLC	.1023	.3862*	.3415*	-.0586	-.2457	.0635
SCACLD	.0377	.2843	.2983	.1646	-.1748	.1076
SCACLE	.1694	.3718*	.3726*	.0675	.0069	.0464
SCACLF	.0536	.3048	.2120	.2214	-.1853	-.1315
SCACLG	.0053	.2573	.1400	.0715	-.0734	-.0363
SCACLALL	.1500	.3592*	.3870*	.1196	-.1538	.0209

* - SIGNIF. LE .01 ** - SIGNIF. LE .001

	C43	C44	C45	C46	C47	C48
C43	1.0000					
C44	.0314	1.0000				
C45	-.0238	.5047**	1.0000			
C46	.0023	.4261**	.5080**	1.0000		
C47	.0652	.4335**	.3274*	.3060	1.0000	
C48	-.0975	.4486**	.5240**	.4472**	.3258*	1.0000
C49	.0088	.2347	.3294*	.3546*	.0911	.2756
TQ50	.0097	-.2768	-.0974	.2617	-.2701	-.0084
TQ51	.0244	.1816	-.0207	-.2116	-.0544	.0506
TQ52	-.1552	-.0981	-.0974	.0275	.2432	-.0937
TQ53	.1428	.1570	.2861	.0059	.1310	.0407
TQ54	-.0843	-.2565	-.0634	.1481	-.3081	-.0332
TQ55	-.0067	-.0145	-.0264	-.0728	-.0694	.1038
TQ56	-.0733	-.0238	-.1049	-.0902	.1444	-.0872
TQ57	.1331	.1475	.1918	.1564	.0317	-.0206
TQ58	.0898	.0721	.2653	.1587	.3215	.2794
TQ59	.1530	-.0066	.2961	.3360*	-.0048	.1820
TQ60	-.0139	.1320	.1120	.0641	.0907	.1482
TQ61	.0381	-.1843	-.0933	-.0517	-.1229	-.1381
TQ62	-.0863	.1882	-.0648	-.0431	.1161	-.0339
TQ63	.0188	.1893	.3588*	.1975	.1500	.0906
TQ64	.1821	-.0964	-.1512	-.0091	-.0417	.0198
TQ65	-.1582	-.1446	-.2977	-.2194	-.1406	-.1187
TQ66	.1736	.1994	.0934	.1309	.0554	.1428
TQ67	-.1105	-.2366	-.0749	-.0944	-.1551	-.3064
TQ68	-.0779	.0685	-.0196	-.0427	.1477	.2463
TQ69	.0564	.1088	.0303	.0660	.2589	.1480
TQ70	.0425	-.1068	.0070	-.0270	-.1808	-.0876
TQ71	-.1067	-.0386	-.0433	-.0569	-.1568	-.1036
TPCI	-.1489	-.1480	.0117	-.0340	-.0988	.0644
LUNCH	-.1177	-.4520**	-.4049*	-.3341*	-.4032*	-.3689*
INNER	-.2014	-.3558*	-.2810	-.2901	-.3906*	-.3398*
SUBUR	.0607	.0280	.1642	.2265	.2925	.2046
RURAL	.1072	.2794	.0592	-.0036	.0093	.0647
AQ77	.2078	-.0685	.1140	.1278	.2593	.0935
AQ78	.0282	.0531	-.1424	-.0241	.0240	.0183
AQ79	-.3369*	-.1484	-.2347	-.2702	-.1940	-.2207
AQ80	.0935	.0513	.0834	-.0732	-.0466	-.0673
AQ81	.0013	-.0130	.1832	.0664	-.0813	.0205
AQ82	-.0843	.1870	.1387	.1481	.1166	-.0332
AQ83	.2176	-.0056	-.2711	-.3825*	-.1182	-.1876
AQ84	-.1490	.0692	.2451	.2619	.2061	.1908
AQ85	-.0843	-.0348	.1387	.1481	.1166	.1785
APCI	-.0659	-.0053	-.0594	-.1872	-.0827	-.1686
AQ87	-.2183	-.2849	-.0693	-.0653	-.0583	-.0700
AQ88	.0349	.0757	.0207	-.1256	.0544	.0108
AQ89	.0466	.1965	.2711	.0490	.3010	.0054
AQ90	.1204	-.2565	-.0634	-.0456	-.3081	-.0332
AQ91	.1072	.1383	-.1336	.1813	-.1258	.0647
AQ92	-.0067	-.1377	-.0264	-.1266	-.0694	-.1903
AQ93	-.0950	.1690	.0804	.1124	.1513	.1614
AQ94	.1428	-.1861	-.2350	-.0940	-.3070	.0407
AQ95	.2111	-.0215	-.1163	-.1390	.1936	-.1820
AQ96	-.0444	.0086	.0158	.0939	-.0591	.1285
AQ97	-.1299	.0085	.0816	.0112	-.0980	.0081
AQ98	.1746	-.0088	-.0974	-.2847	.1577	-.1790
AQ99	.1526	.0184	.0335	.1059	-.1513	.0772
AQ100	-.3030	-.0135	.0382	.1027	.0453	.0529
SQA1	.0919	.0364	-.1495	.1626	.2030	-.0728
SQA2	-.0626	.0859	.1432	.3362*	.1824	.0259
SQA3	.1099	.2019	.1002	-.0359	.0404	.0847
SQA4	-.1227	-.2427	-.0452	-.2392	-.3335*	.0413

* - SIGNIF. LE .01   ** - SIGNIF. LE .001

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                C43          C44          C45          C46          C47          C48

SQAS         -.1762        .0271        .0824       -.0812        .0241        .0734
SQ2           .0229        .3233        .3177        .1158        .1724        .1977
SQ3           .0565        .2622        .2023       -.0549        .3589*       .0929
SQ4           .1420        .1057        .0299        .2138        .2719       -.0270
SQ5           .0729        .3890*       .2936       -.0568        .4177*       .0588
SQ6          -.0261        .2483        .2390       -.1339        .3661*       .0789
SQ7           .1340        .3513*       .2238       -.0238        .5294**      .1445
SQ8          -.0609        .1708       -.0199       -.2944        .0979       -.1635
CASTA         .0457        .2318        .0931       -.1348        .2551       -.0343
CASTAAJ       .0418        .1664        .0256       -.1634        .2233       -.0785
CASTB         .0806        .2844        .3008        .0138        .4697**      .0313
CASTBAJ       .0775        .1825        .2021       -.0287        .4371**     -.0408
SCRALL        .0805        .2662        .3159       -.0219        .2947        .0159
SCACLA        .3619*       .1791        .0679        .0860        .0517        .0356
SCACLB        .1449       -.0556        .0858        .0169       -.1480       -.0531
SCACLC        .3339*       .1723        .1026       -.0402       -.0082       -.1401
SCACLD        .2407        .1502        .0038        .1435        .0959       -.1776
SCACLE        .4089*       .1185       -.0063        .1197       -.1505       -.1197
SCACLF        .0904        .1804        .0339        .1355       -.0955       -.1810
SCACLG        .3993*       .2694        .0105        .0331       -.1034       -.0785
SCACLALL      .4371**      .2479        .0615        .1185       -.0738       -.1663

* - SIGNIF. LE .01      ** - SIGNIF. LE .001      (1-TAILED)

" . " IS PRINTED IF A COEFFICIENT CANNOT BE COMPUTED
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	C49	TQ50	TQ51	TQ52	TQ53	TQ54
C49	1.0000					
TQ50	.1058	1.0000				
TQ51	-.0212	-.5401**	1.0000			
TQ52	-.1939	-.1591	-.5401**	1.0000		
TQ53	.1504	-.1164	-.3950*	-.1164	1.0000	
TQ54	.0729	.3546*	-.1915	-.0564	-.0413	1.0000
TQ55	.1337	.2619	.2079	-.4231**	-.1633	-.1500
TQ56	-.2708	-.2575	-.0636	.4929**	-.1883	-.0913
TQ57	.1279	-.1720	-.1327	-.0154	.4758**	-.0610
TQ58	.4449**	.0147	.0779	-.1215	-.0017	.1260
TQ59	.5023**	.2243	-.0553	-.0891	-.0747	.1906
TQ60	.1824	-.0794	-.0442	-.0093	.1842	-.0466
TQ61	-.2026	.0939	.0152	.0254	-.1716	-.0413
TQ62	.0746	-.0528	.1025	-.0576	-.0421	.1022
TQ63	.0380	.1074	-.0092	.0126	-.1287	-.0724
TQ64	.1741	.0821	.0985	-.1345	-.0983	-.1690
TQ65	-.1741	-.1846	-.0633	.0865	.2212	-.1656
TQ66	-.1396	-.2650	.0695	.0754	.0996	-.1353
TQ67	.0557	.3548*	-.0980	-.0738	-.1594	.1044
TQ68	.1104	-.1490	.0462	.0033	.0935	.0354
TQ69	-.0930	-.0439	.1166	-.1335	.0197	-.1500
TQ70	.1928	.2424	-.1247	.0284	-.1089	-.1394
TQ71	-.0570	-.1612	-.0322	.1384	.0724	.1442
TPCI	-.2428	-.0953	-.1043	-.0287	.3441*	.0181
LUNCH	-.1814	-.0788	.0206	.1647	-.1466	.2310
INNER	-.2122	-.0352	.0190	.1143	-.1350	.3055
SUBUR	.0368	.1173	-.0634	-.1128	.1068	-.1624
RURAL	.1439	-.1025	.0554	.0282	-.0033	-.0827
AQ77	-.0699	-.0662	.0862	.0368	-.1142	.1678
AQ78	-.0498	.1415	.0794	-.2055	-.0579	-.0280
AQ79	.0145	-.1579	.0135	.0468	.1183	-.0377
AQ80	.0698	.0155	-.0899	-.0750	.2344	.0855
AQ81	.0008	.1191	-.2688	.2473	.0050	-.1959
AQ82	.0729	-.0564	.1044	-.0564	-.0413	-.0200
AQ83	-.0816	-.2081	.3671*	-.2081	-.1198	-.3873*
AQ84	.1289	-.0597	-.3385*	.3846*	.2370	-.0354
AQ85	-.1750	.3546*	-.1915	-.0564	-.0413	-.0200
APCI	-.1183	-.0682	.0134	.0761	-.0340	.2520
AQ87	-.1717	.0282	-.1329	.1589	-.0033	-.0827
AQ88	.0212	-.1753	.0303	.0631	.0898	-.1044
AQ89	-.0251	-.1456	.1423	-.1456	.1198	-.0516
AQ90	.0729	.3546*	-.1915	-.0564	-.0413	-.0200
AQ91	.1439	.1589	.0554	-.1025	-.1706	.2418
AQ92	-.2107	.0336	-.1209	.1477	-.0172	.1333
AQ93	.2219	-.1022	.2011	-.2179	.0523	-.1183
AQ94	-.2332	.0956	-.0898	.0956	-.0851	-.0413
AQ95	-.1557	-.0154	-.1327	.1413	.0747	-.0610
AQ96	.0083	-.0297	.1631	-.1465	-.0644	-.1761
AQ97	.1240	.0474	-.0740	.0474	.0101	.2550
AQ98	.0059	.0065	-.0631	.0065	.0956	-.0564
AQ99	-.0123	.1022	-.0343	-.1294	.0959	.1183
AQ100	.0091	-.1177	.0865	.1377	-.1795	-.0870
SQA1	.0137	.0008	-.0506	.1079	-.0493	.0857
SQA2	.1463	-.0419	-.0127	.0126	.0601	.1475
SQA3	-.0965	-.0730	.0373	.0682	-.0600	-.1418
SQA4	.0219	.0328	.0166	-.1524	.1237	.0153
SQA5	.0375	.0638	.0803	-.1711	-.0055	-.1172
SQ2	-.1162	-.1104	-.1101	.1455	.1507	-.1442
SQ3	.0342	-.1737	.0435	.0167	.1236	-.1920
SQ4	.0432	.0162	-.1237	.0754	.1027	-.1703
SQ5	.0190	-.3122	.0786	.1162	.1111	-.3891*

* - SIGNIF. LE .01   ** - SIGNIF. LE .001

	C49	TQ50	TQ51	TQ52	TQ53	TQ54
SQ6	-.0605	-.1586	-.0287	.0849	.1454	-.3566*
SQ7	.0045	-.2456	.0507	.0932	.1050	-.4287**
SQ8	-.1505	-.3049	.1611	.0319	.0631	-.7684**
CASTA	-.1155	-.1824	.0388	.0533	.0963	-.3132
CASTAAJ	-.0927	-.1625	.0638	.0227	.0655	-.2889
CASTB	.0819	-.1210	-.1143	.1020	.2276	-.1365
CASTBAJ	.1311	-.0878	-.0808	.0543	.1865	-.0917
SCRALL	.0208	-.1014	.1805	-.1104	-.0498	-.1097
SCACLA	.1717	.2247	-.0646	.0144	-.1913	.1356
SCACLB	-.2107	.0716	-.0387	-.0045	-.0172	-.0556
SCACLC	.0725	-.1170	.0342	.0443	.0324	.0157
SCACLD	.1008	-.0713	.1371	.0283	-.1888	-.3078
SCACLE	.1265	.1231	-.0213	.0226	-.1487	.2395
SCACLF	.0289	.0891	-.1253	.1319	-.0602	-.0292
SCACLG	.0617	-.0043	-.0368	-.0043	.0763	-.2325
SCACLALL	.0957	.0707	-.0277	.0591	-.1169	-.0494

* - SIGNIF. LE .01   ** - SIGNIF. LE .001

	TQ55	TQ56	TQ57	TQ58	TQ59	TQ60
TQ55	1.0000					
TQ56	-.6847**	1.0000				
TQ57	-.4575**	-.2784	1.0000			
TQ58	.0525	.0605	-.1959	1.0000		
TQ59	-.0466	-.1160	.1366	.4752**	1.0000	
TQ60	-.1520	.0352	.1627	.1308	.2607	1.0000
TQ61	.1143	-.0088	-.1445	-.1187	-.2040	-.9604**
TQ62	.1319	-.0535	-.0623	-.0409	-.1981	-.1266
TQ63	.0088	.0476	-.0714	.1354	.1412	.2286
TQ64	-.0936	.0727	.0364	.2227	.2774	-.1612
TQ65	.0602	-.1091	.0546	-.3222	-.3698*	-.1410
TQ66	-.1847	.2672	-.0829	.1975	.2147	.0442
TQ67	.0771	-.1572	.0917	-.2025	-.1480	-.0355
TQ68	.1411	-.1384	-.0189	.0220	-.0799	-.0093
TQ69	-.1287	.2138	-.0923	.2849	.0412	.1938
TQ70	.0939	-.1074	.0067	.1880	.1707	-.0794
TQ71	.0744	-.1667	.1071	-.5155**	-.2017	-.1671
TPCI	-.0291	-.0962	.1561	-.4099*	-.2442	.0403
LUNCH	-.3653*	.3190	.0135	-.2533	-.1287	.0140
INNER	-.1818	.1527	-.0582	-.3255*	-.2246	-.0571
SUBUR	.0513	-.0460	.0491	.0761	.1686	.1012
RURAL	.1007	-.0813	-.0049	.1983	.0049	-.0661
AQ77	-.1724	.2246	-.1177	.2087	.1172	.1876
AQ78	.2270	-.2009	-.0478	.1212	.0261	-.1135
AQ79	-.0771	.0595	.0468	-.2536	-.3113	.1566
AQ80	.0776	-.1907	.1060	-.1542	-.0796	-.1565
AQ81	-.0271	-.0253	.1511	-.0084	.1619	-.0570
AQ82	-.1500	.2191	-.0610	-.0431	.0610	.1612
AQ83	.2654	-.0314	-.1772	-.0342	-.2691	-.2417
AQ84	-.2652	.0215	.3505*	.0234	.1842	.2850
AQ85	.1333	-.0913	-.0610	-.0431	.0610	-.1266
APCI	-.1486	.0827	.0043	-.1334	-.1180	.0205
AQ87	-.0795	.2149	-.1286	-.2320	-.0364	.0257
AQ88	.1209	-.1165	.0199	.0692	.0929	.0067
AQ89	-.0215	.0314	.0098	.0342	-.2330	.0446
AQ90	.1333	-.0913	-.0610	-.0431	.0610	-.1266
AQ91	-.0795	-.0613	.1189	.1445	.0873	-.0264
AQ92	-.1019	.1775	-.1334	-.0884	-.1186	.1258
AQ93	.1502	-.1903	.0773	.1261	.1053	-.1012
AQ94	-.0172	-.0282	.0747	-.2633	-.0747	-.1129
AQ95	-.0254	.0766	-.0378	.1264	-.1105	.0528
AQ96	.0473	.0778	-.0953	.0047	.1321	.0299
AQ97	-.0327	-.1552	.1421	-.1138	-.0573	-.0817
AQ98	.0336	-.0074	-.0154	.1509	.0154	-.0093
AQ99	.0094	-.1594	.1418	-.0784	.2599	.0196
AQ100	-.0362	.1815	-.1445	-.0299	-.2985	-.0144
SQA1	-.0732	.1042	-.0628	.0173	.0003	.1647
SQA2	-.2167	.0969	.1198	-.0006	.2173	.0719
SQA3	-.2232	.2396	.0601	-.0764	.0710	.0009
SQA4	.2103	-.1634	-.0897	-.0221	-.1342	-.2131
SQA5	.3359*	-.2814	-.0637	.2066	-.1348	-.1614
SQ2	-.1808	.0945	.1847	-.0171	-.0020	.0495
SQ3	.0293	.0051	.0266	-.0014	-.1747	-.1343
SQ4	-.2259	.2585	.0511	.0319	.1391	.1156
SQ5	.0512	.1380	-.0947	-.0798	-.1042	-.1237
SQ6	.1288	.0757	-.1358	-.1368	-.2116	-.2260
SQ7	.0185	.1703	-.0752	.0171	-.1051	-.1155
SQ8	.0691	.0836	.0934	-.0991	-.2308	-.2315
CASTA	-.0802	.1398	.0543	-.0611	-.2059	-.1875
CASTAAJ	-.0425	.1224	.0151	-.0588	-.2103	-.2016
CASTB	-.1704	.0995	.1613	.1531	.0129	.0075

* - SIGNIF. LE .01   ** - SIGNIF. LE .001

	TQ55	TQ56	TQ57	TQ56	TC59	TQ60
CASTBAJ	-.1142	.0708	.1029	.1699	.0146	-.0106
SCHALL	.0860	.1123	-.2169	-.0057	-.1026	-.2049
SCACLA	-.1791	.2219	-.0839	.2273	.0673	.0490
SCACLB	-.0494	-.0237	.1186	-.0884	-.0706	.0213
SCACLC	-.1417	-.0502	.2514	.0338	.0539	-.1641
SCACLD	-.1111	.1748	.0508	.0538	.1848	.0411
SCACLE	-.0387	-.1204	.1127	-.0211	.2198	.1492
SCACLF	-.1008	-.0038	.1543	-.1511	.0215	-.1249
SCACLG	.0903	-.0772	.0615	-.2554	-.0957	-.0672
SCACLALL	-.1212	.0301	.1475	-.0441	.0955	-.0268

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	TQ61	TQ62	TQ63	TQ64	TQ65	TQ66
TQ61	1.0000					
TQ62	-.1548	1.0000				
TQ63	-.2539	.0935	1.0000			
TQ64	.1739	-.0476	-.5092**	1.0000		
TQ65	.1605	-.0714	-.7638**	-.1667	1.0000	
TQ66	-.0152	-.1025	.2856	-.0985	-.2533	1.0000
TQ67	.0771	-.1487	-.1048	-.0801	.1801	-.7470**
TQ68	-.0902	.3541*	-.2390	.2498	.0865	-.2896
TQ69	-.2181	.0891	.3694*	-.2376	-.2450	.3536*
TQ70	.0939	-.0528	-.0269	.2872	-.1846	-.2650
TQ71	.1839	-.0623	-.4286**	.0364	.4637**	-.1981
TPCI	.0011	-.1467	-.1454	-.1573	.2845	.0051
LUNCH	.0052	-.0683	-.2562	.1304	.1957	-.1597
INNER	-.0350	.3273	-.0714	-.1455	.1909	-.1981
SUBUR	-.0537	-.1679	.1503	.1486	-.2837	.1831
RURAL	.0897	-.0847	-.1094	-.0456	.1596	-.0404
AQ77	-.1999	.0444	.0279	-.0170	-.0192	.0712
AQ78	.1660	-.1849	.0033	.1157	-.0943	.1019
AQ79	-.2177	.2150	-.0296	-.2087	.1978	-.2110
AQ80	.0347	.4248*	-.0321	-.0580	.0828	-.1730
AQ81	.1383	-.2849	.0583	.0528	-.1092	.0760
AQ82	-.1548	-.0204	.0935	-.0476	-.0714	.1990
AQ83	.2274	.0476	-.2182	.1111	.1667	-.1830
AQ84	-.2737	-.0361	.1654	-.0842	-.1263	.1742
AQ85	.1319	-.0204	.0935	-.0476	-.0714	-.1025
APCI	-.0638	.1547	.0938	-.3643*	.1658	-.2180
AQ87	-.0018	-.0847	-.0099	-.0456	.0456	.0558
AQ88	.0234	-.1071	-.0546	.0278	.0417	.0774
AQ89	-.0296	-.0528	.1074	-.1231	-.0308	-.1351
AQ90	.1319	-.0204	.0935	-.0476	-.0714	-.1025
AQ91	-.0451	.2542	-.0409	.1249	-.0468	-.0079
AQ92	-.1639	.1373	-.0175	.1868	-.1201	-.0710
AQ93	.1350	-.1216	.0265	-.1486	.0810	.0736
AQ94	.1242	-.0421	-.1287	-.0983	.2212	.0996
AQ95	-.0350	-.0623	.1667	-.1455	-.0818	.2626
AQ96	.0215	-.1825	-.1529	.1236	.0824	.0400
AQ97	.0058	.2690	.0316	-.0161	-.0241	-.2793
AQ98	.0254	-.0576	.2641	-.1345	-.2017	.1971
AQ99	.0276	-.1679	-.3802*	.2837	.2229	-.1591
AQ100	-.0500	.2291	.2138	-.2079	-.0891	.0226
SQA1	-.1287	-.1257	.0216	-.1002	.0504	-.0518
SQA2	-.0298	-.1489	-.0075	-.0473	.0441	.0851
SQA3	-.0338	.1170	.0977	-.0009	-.1112	.2288
SQA4	.2222	-.0355	-.0792	.0840	.0277	-.0652
SQA5	.1003	.2152	.0839	-.0069	-.0910	-.0408
SQ2	-.0645	.0541	.0206	.0315	-.0473	.1118
SQ3	.0366	.3460*	.0814	-.0315	-.0696	-.0924
SQ4	-.1409	.0918	.1165	.0890	-.2002	.0736
SQ5	.0461	.2745	.0549	-.0180	-.0494	.0523
SQ6	.1369	.3140	.0395	-.0420	-.0138	-.0605
SQ7	.0386	.2723	.1031	.0787	-.1772	.1128
SQ8	.2076	.0815	-.1855	.0108	.2084	-.0904
CASTA	.1036	.2959	-.0409	.1381	-.0567	-.1569
CASTAAJ	.1198	.2882	-.0462	.1331	-.0469	-.1847
CASTB	-.0742	.2376	-.0410	.1292	-.0499	-.3000
CASTBAJ	-.0547	.2323	-.0512	.1255	-.0354	-.3606*
SCRALL	.1405	.2262	.0381	-.0466	-.0087	-.1335
SCACLA	-.0881	.1396	.1247	.0799	-.2028	-.2328
SCACLB	-.0053	-.0568	.0289	.1325	-.1325	.1063
SCACLC	.1215	.1495	.0489	-.0249	-.0374	.0016
SCACLD	-.0942	.1897	.2422	.0788	-.3366*	.1467
SCACLE	-.1111	-.1335	.0235	.1677	-.1528	.0121

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             TQ61        TQ62        TQ63        TQ64        TQ65        TQ66

SCACLF       .0729       .1631       .0715      -.1192       .0075       .1019
SCACLG       .0187       .1719       .0169      -.1164       .0679       .0852
SCACLALL    -.0161       .1526       .1250       .0311      -.1666       .0465

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	TQ67	TQ68	TQ69	TQ70	TQ71	TPCI
TQ67	1.0000					
TQ68	-.4199*	1.0000				
TQ69	-.3317*	-.0051	1.0000			
TQ70	.3548*	-.1490	-.5922**	1.0000		
TQ71	.0917	.1384	-.6999**	-.1612	1.0000	
TPCI	-.0596	.0789	-.1529	-.0803	.2585	1.0000
LOWCH	.1984	-.0677	-.1859	.0910	.1471	-.0138
INNER	.2009	-.0189	-.0923	.0067	.1071	.0954
SUBUR	-.1687	-.0070	.1913	-.1846	-.0707	.0455
RURAL	.0219	.0237	-.1381	.2020	-.0099	-.1352
AQ77	-.0462	-.0311	.1675	.0314	-.2404	-.0732
AQ78	-.0625	-.0495	.0193	-.1417	.1086	-.1591
AQ79	.1702	.0447	.0389	-.0999	.0447	.1624
AQ80	.0867	.1116	.0315	.0328	-.0703	.0870
AQ81	-.0347	-.0539	-.2140	.1005	.1753	-.1255
AQ82	-.1487	-.0576	.0891	-.0528	-.0623	-.0149
AQ83	.2135	-.0576	-.0594	.1231	-.0364	-.1179
AQ84	-.2630	.1408	-.0300	-.0933	.1195	.1294
AQ85	.1373	-.0576	.0891	-.0528	-.0623	.0512
APCI	.1315	.1084	.0632	-.0948	.0062	.0266
AQ87	.1132	-.2392	-.0366	.0617	-.0099	.4324**
AQ88	-.2802	.2978	-.0891	-.1487	.2409	-.0778
AQ89	.1084	.0284	.0932	-.1364	.0067	-.0100
AQ90	.1373	-.0576	-.2291	.3869*	-.0623	.0181
AQ91	.0712	-.0918	.1418	.0807	-.2453	-.3454*
AQ92	.0305	.0415	-.1534	.1084	.0917	.1269
AQ93	-.0746	.0070	.1697	-.1895	-.0398	-.0881
AQ94	-.0118	-.1190	-.1445	.1180	.0724	.1907
AQ95	-.1267	-.1761	.2722	-.1612	-.1905	-.1462
AQ96	-.0924	.0784	-.0294	-.0913	.1169	.0471
AQ97	.2203	.0640	-.2065	.2496	.0316	.0711
AQ98	-.0738	-.1628	.2516	-.1490	-.1761	-.1751
AQ99	.0746	.1098	-.2599	.0648	.2609	.0695
AQ100	-.0250	.0051	.0913	.0439	-.1507	.0584
SQA1	.0676	-.0266	.0993	-.1812	.0389	-.0967
SQA2	.0656	-.2107	.0398	-.1431	.0782	.0748
SQA3	-.2196	.0038	.1046	-.0507	-.0831	.0955
SQA4	-.1048	.2398	-.1556	.1448	.0622	.1272
SQA5	.1161	-.1115	-.0042	.2761	-.2396	-.1541
SQ2	-.1458	.0573	-.0147	.0087	.0103	-.0100
SQ3	-.0604	.2132	.1109	-.1427	-.0093	-.0186
SQ4	.0007	-.1015	.0360	.0062	-.0496	-.0280
SQ5	-.2016	.2189	.1416	-.3126	.1038	.0009
SQ6	-.1170	.2511	.0505	-.1945	.1105	.0944
SQ7	-.2172	.1587	.1901	-.2361	-.0236	-.0027
SQ8	.1843	-.1420	-.1160	.1443	.0141	.0105
CASTA	.0841	.0932	-.0480	-.0629	.1145	-.1301
CASTAAJ	.1184	.0617	-.0454	-.0658	.1140	-.1310
CASTB	.1485	.1559	-.0321	.1586	-.1014	-.1745
CASTBAJ	.2122	.1868	-.0286	.1653	-.1116	-.1827
SCHALL	.1132	.0192	.1077	-.2667	.1045	-.1224
SCACLA	.2790	-.0640	.0476	.1339	-.1770	-.6131**
SCACLB	.0636	-.2367	-.1652	.1793	.0434	.0137
SCACLC	-.0329	.0452	-.0699	-.0736	.1509	-.4032*
SCACLD	.0350	-.2506	-.0178	.0426	-.0159	-.4175*
SCACLE	.0345	-.0663	-.1777	.1526	.0824	-.3423*
SCACLF	.0811	-.2559	-.1686	.1522	.0715	-.2870
SCACLG	.0482	-.1857	-.1020	.0263	.1016	-.3129
SCACLALL	.1119	-.2246	-.1415	.1320	.0563	-.5446**

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	LUNCH	INNER	SUBUR	RURAL	AQ77	AQ78
LUNCH	1.0000					
INNER	.7562**	1.0000				
SUBUR	-.4079*	-.5315**	1.0000			
RURAL	-.1979	-.2708	-.6715**	1.0000		
AQ77	.2009	.1092	-.1253	.0454	1.0000	
AQ78	-.1931	-.2062	.2509	-.1018	-.3483*	1.0000
AQ79	.2422	.3385*	-.2177	-.0517	-.3825*	-.2024
AQ80	.0386	.3218	-.2671	.0187	-.0158	-.4214*
AQ81	-.2038	-.2562	.1201	.1244	-.3241	-.0465
AQ82	-.0711	-.0655	-.1624	.2418	.2952	-.1842
AQ83	.0535	.0094	-.0723	.0739	-.1593	.1063
AQ84	-.1257	-.1157	.2177	-.1462	-.0790	-.0957
AQ85	-.0711	-.0655	.1232	-.0827	.0403	.1281
APCI	.1958	.3301*	-.2993	.0514	.1624	-.2526
AQ87	.1866	.2013	.1461	-.3421*	-.1587	-.1918
AQ88	-.1959	-.2343	.1462	.0388	-.1182	.1738
AQ89	-.1835	-.1690	-.0506	.2054	.0942	.0074
AQ90	-.0711	-.0655	-.1624	.2418	.0403	-.0280
AQ91	.1866	.2013	-.2173	.0709	.2087	.0083
AQ92	.3900*	.3334*	-.0280	-.2598	-.0461	-.2730
AQ93	-.4205*	-.3873*	.1656	.1506	-.0064	.3238
AQ94	.1650	.2476	-.3349*	.1641	.0175	-.0176
AQ95	-.2168	-.1997	.2668	-.1286	-.0716	.0635
AQ96	-.0252	-.2603	-.0509	.2855	-.0303	.0940
AQ97	.2149	.4708**	-.1702	-.2184	.0962	-.1620
AQ98	-.2005	-.1646	.2324	-.1025	-.2979	.2046
AQ99	.0801	-.0307	-.0852	.1237	-.0598	.1237
AQ100	.0663	.1763	-.0852	-.0573	.2963	-.2940
SQA1	-.0968	-.1206	-.0183	.1263	-.1626	.1277
SQA2	-.0248	-.1126	.0650	.0246	.0361	-.0946
SQA3	.0181	.0932	.0125	-.0957	.1547	-.2637
SQA4	.0770	.1150	.0203	-.1237	-.1646	.1371
SQA5	-.1205	-.1488	.0047	.1248	.0228	.1055
SG2	-.0472	-.1194	.0365	.0630	.3876*	-.1058
SQ3	-.1695	.0472	.1248	-.1831	.1065	.0855
SQ4	-.0317	-.0772	-.0683	.1452	.1986	-.1355
SQ5	-.2110	-.0493	.0734	-.0403	-.0061	.0158
SQ6	-.1310	.1040	.0847	-.1872	.0285	.0012
SQ7	-.3095	-.2181	.1391	.0328	.1900	-.0761
SQ8	-.0368	-.1189	-.0302	.1383	-.2520	.1103
CASTA	-.0461	.0663	.1920	-.2937	-.0960	.1747
CASTAAJ	-.0369	.1145	.1885	-.3144	-.1828	.2018
CASTB	-.1298	-.0723	.0473	.0095	.1787	-.1312
CASTBAJ	-.1209	-.0324	.0369	-.0135	.0474	-.1014
SCRALL	-.2137	.0593	.0033	-.0556	-.0200	.0306
SCACLA	-.0205	.0167	-.0680	.0627	.2341	.0311
SCACLB	-.1415	-.1132	.1306	-.0495	.0579	.0989
SCACLC	-.1418	-.0942	-.0967	.1923	.0807	.0115
SCACLD	-.0689	-.1084	.0617	.0247	.0894	-.1217
SCACLE	.0760	-.0773	-.1142	.1974	.2997	.1752
SCACLF	-.0093	.1365	-.1477	.0484	-.0366	.0206
SCACLG	-.0681	.0231	-.0769	.0673	.0181	-.0617
SCACLALL	-.0727	-.0353	-.0849	.1274	.1623	.0296

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	AQ79	AQ80	AQ81	AQ82	AQ83	AQ84
AQ79	1.0000					
AQ80	.2933	1.0000				
AQ81	-.3077	-.3293	1.0000			
AQ82	.0889	-.0265	-.0372	1.0000		
AQ83	.0430	.0686	-.1089	-.3873*	1.0000	
AQ84	.0079	-.1129	.3084	-.0354	-.6847**	1.0000
AQ85	-.1644	-.0265	-.0372	-.0200	-.3873*	-.0354
APCI	.1550	.5142**	-.3910*	.0014	.0580	-.1663
AQ87	.2486	.0689	-.0788	-.0827	.0739	-.1462
AQ88	-.0928	-.3600*	.2597	-.1044	-.1124	.3385*
AQ89	.0302	-.0619	.0242	.3873*	-.0556	-.0913
AQ90	-.1644	.0855	.1214	-.0200	.0516	-.0354
AQ91	-.1166	.3558*	-.2567	-.0827	.0739	-.1462
AQ92	.2244	.2806	-.0720	-.1500	-.1004	.0687
AQ93	-.1589	-.3909*	.0824	.1690	.0582	-.0398
AQ94	-.0125	.1765	-.0360	-.0813	.1065	-.0729
AQ95	.0299	-.0383	.0985	-.0610	.1575	-.1078
AQ96	-.1108	-.2663	.0773	.1136	-.0440	.0301
AQ97	.1010	.3372*	-.1730	-.0784	-.0844	.0578
AQ98	.1492	.1512	.0229	-.0564	.1456	-.0997
AQ99	-.2079	-.2569	.0648	-.1690	-.0582	.0398
AQ100	.1122	.1642	-.0887	.2299	-.0481	.0330
SQA1	.1724	-.2658	-.0597	-.1269	.1332	-.1147
SQA2	.1391	-.0081	-.0944	.2152	-.0082	-.1140
SQA3	-.1906	.0688	.0033	.0084	-.2157	.2922
SQA4	-.1535	-.0445	.2280	-.0486	.1034	-.0708
SQA5	-.1016	.0834	-.0463	-.1172	.0606	-.0231
SQ2	-.3852*	-.1114	.1301	.1232	-.3613*	.3557*
SQ3	-.2416	.1473	-.1117	-.0976	.0486	.0688
SQ4	.1659	.0743	-.2337	.1819	-.2548	.2696
SQ5	-.1669	.0781	.0431	.0539	.2041	.0082
SQ6	-.1458	.2429	-.0360	.0639	.0725	.0665
SQ7	-.1551	.0243	.0293	.1757	-.0353	.1867
SQ8	.0653	-.0426	.1796	-.0800	.4605**	-.1125
CASTA	-.1157	.0781	-.0636	-.3055	.2853	-.0229
CASTAAJ	-.0342	.1042	-.0935	-.3397*	.3712*	-.1015
CASTB	-.1717	.1410	.0305	-.1025	.0558	.1298
CASTBAJ	-.0407	.1929	-.0157	-.1557	.1953	.0052
SCBALL	-.1257	.1597	-.0604	.0979	.1504	-.1774
SCACLA	-.2916	-.0304	-.0209	-.1254	.0991	-.1447
SCACLB	.0149	-.0736	-.0085	.1333	-.0191	.0131
SCACLC	-.2901	-.0258	.1919	-.1177	.1317	-.0509
SCACLD	-.0310	-.0770	.1466	.0630	.1565	.0386
SCACLE	-.3668*	-.1129	.0650	.1148	-.0820	-.0173
SCACLF	.0165	-.0480	.1209	-.0292	.0754	.0111
SCACLG	-.1814	.0935	.1004	-.0978	.3684*	-.1728
SCACLALL	-.2521	-.0600	.1380	-.0205	.1651	-.0703

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	AQ85	APCI	AQ87	AQ88	AQ89	AQ90
AQ85	1.0000					
APCI	-.1060	1.0000				
AQ87	.2418	.0058	1.0000			
AQ88	-.1044	-.2835	-.4320**	1.0000		
AQ89	-.0516	.1269	-.2136	-.2697	1.0000	
AQ90	-.0200	.0730	-.0827	-.1044	-.0516	1.0000
AQ91	-.0827	.1880	-.3421*	-.4320**	-.2136	-.0827
AQ92	.1333	.2194	.3712*	-.2079	-.0215	-.1500
AQ93	-.1183	-.3346*	-.3065	.2991	.0655	-.1183
AQ94	-.0413	.1321	-.0033	-.2155	-.1065	.4848**
AQ95	-.0610	-.1186	-.0049	.1327	.0098	-.0610
AQ96	.1136	-.1198	.0090	.0049	.0440	.1136
AQ97	-.0784	.2395	-.0062	-.1195	-.0591	-.0784
AQ98	-.0564	.0905	.0282	.0631	.0312	-.0564
AQ99	.1183	-.1798	-.0592	.2011	-.0655	-.1690
AQ100	-.0870	.1284	.0435	-.2704	.0481	.2299
SQA1	-.0737	-.1180	.0163	.0467	.1127	-.1269
SQA2	-.1502	-.1405	.1064	-.0540	.0723	-.2043
SQA3	.1386	.1660	.0827	.1138	-.2454	.0285
SQA4	-.0869	-.0096	-.0140	-.0613	.0614	.1302
SQA5	.1327	-.1855	-.0739	-.1649	.0469	.2160
SQ2	.2569	-.0262	-.1816	.1392	.0305	-.0105
SQ3	.0599	.0676	-.1631	.1209	.1004	.1229
SQ4	.1232	-.1374	.0051	.0897	-.1493	.0058
SQ5	-.1529	-.0411	-.0216	.1270	.2407	-.0643
SQ6	.0113	.0905	-.0200	.0592	.2102	.0376
SQ7	.0180	-.2374	-.1261	.2543	.1257	-.1134
SQ8	-.0309	-.1738	.0601	-.0327	.0261	.0675
CASTA	-.0053	.0096	-.0635	.1176	-.0501	-.0053
CASTAAJ	-.0617	.0155	-.0252	.0898	-.0579	-.0031
CASTB	-.1110	.0147	-.1774	.0872	.0944	.0422
CASTBAJ	-.2150	.0255	-.1213	.0409	.0894	.0491
SCBALL	-.0367	.1225	-.0592	.0653	.3011	-.0592
SCACLA	.0051	.1736	-.3939*	-.0490	.0694	.1356
SCACLB	-.0556	-.1685	-.0495	-.0161	-.0622	.1333
SCACLC	-.1177	.1722	-.4869**	.2755	-.0169	.1491
SCACLD	-.1842	-.1216	-.1326	.0422	-.1033	.0630
SCACLE	-.1344	-.0081	-.4765**	.0574	.0284	.2395
SCACLF	-.1356	-.1025	-.1546	.1253	-.1669	.0772
SCACLG	-.2325	-.0121	-.1900	-.0023	-.0205	.1718
SCACLALL	-.1943	-.0108	-.4257**	.1034	-.0653	.2114

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	AQ91	AQ92	AQ93	AQ94	AQ95	AQ96
AQ91	1.0000					
AQ92	-.0795	1.0000				
AQ93	-.0323	-.8874**	1.0000			
AQ94	.1641	-.1633	-.2441	1.0000		
AQ95	-.1206	-.1334	.0773	.0747	1.0000	
AQ96	-.0831	-.0331	.1008	-.0644	-.5370**	1.0000
AQ97	.2059	.1525	-.1823	.0101	-.2393	-.6906**
AQ98	-.1025	-.0806	.0136	.0956	.7680**	-.3799*
AQ99	-.0592	.0094	.0524	-.0523	-.5155**	.5520**
AQ100	.1443	.0518	-.0683	-.0160	-.0237	-.3159
SQA1	-.1105	-.1175	.1702	-.1110	.1906	.0716
SQA2	-.0356	-.1716	.2323	-.0725	.0682	-.0078
SQA3	-.0352	.2469	-.2999	.0742	-.0850	.0345
SQA4	-.0059	-.1728	.1695	.0447	-.2066	.0692
SQA5	.1513	-.0806	.0400	.0160	-.0002	-.0736
SQ2	.0098	-.0137	-.0150	-.0216	-.1212	.0880
SQ3	-.0829	-.1456	.0705	.0099	.2547	-.3670*
SQ4	.0051	-.0302	.0423	-.0638	-.0384	.1507
SQ5	-.2752	-.0719	.1189	-.1478	.1417	-.0962
SQ6	-.2123	.0120	-.0292	-.0037	.0446	-.1465
SQ7	-.2097	-.1567	.2326	-.1796	.1652	-.0353
SQ8	-.0650	-.0675	.0530	.1139	-.0004	.2450
CASTA	-.0267	-.0353	.0186	-.0744	.1680	-.2695
CASTAAJ	-.0295	-.0332	.0223	-.0714	.1993	-.2951
CASTB	-.0014	-.0380	.0508	-.2026	.0314	-.0126
CASTBAJ	-.0052	-.0354	.0599	-.2084	.0791	-.0465
SCRALL	-.2162	.0096	.0355	-.1713	.0933	.0175
SCACLA	.3532*	-.1066	-.0065	-.0567	.1151	-.1402
SCACLB	.0707	-.0494	-.0094	.1776	.1906	-.0600
SCACLC	.1498	-.2529	.1305	.1012	.2005	-.0134
SCACLD	.1427	-.0424	-.0102	.0025	.0508	-.0771
SCACLE	.3164	-.1079	-.0227	.1726	.0652	-.0860
SCACLF	.1161	-.1894	.1269	.1043	.2354	-.2268
SCACLG	.1530	-.2092	.1050	.1458	.1128	-.1336
SCACLALL	.2934	-.2178	.0749	.1371	.2138	-.1719

* - SIGNIF. LE .01   ** - SIGNIF. LE .001

	AQ97	AQ98	AQ99	AQ100	SQA1	SQA2
AQ97	1.0000					
AQ98	-.2212	1.0000				
AQ99	-.1934	-.4767**	1.0000			
AQ100	.3839*	-.2453	-.7352**	1.0000		
SQA1	-.2458	.0383	.1293	-.1721	1.0000	
SQA2	-.0494	.0453	.0612	-.1025	.4519**	1.0000
SQA3	.0331	-.0609	.0460	-.0037	-.2717	-.3945*
SQA4	.0975	-.0958	.0284	.0426	-.4876**	-.4760**
SQA5	.0849	.0554	-.2102	.1893	-.4669**	-.2288
SQ2	.0026	-.2046	.1374	.0063	-.5595**	-.4109*
SQ3	.2041	.1616	-.2301	.1138	-.2243	-.1778
SQ4	-.1405	-.0429	.0900	-.0662	.1910	.1651
SQ5	-.0108	.1043	-.0357	-.0410	-.0558	.0212
SQ6	.1304	.1167	-.1115	.0330	-.3421*	-.2381
SQ7	-.1011	.1144	-.0845	.0050	-.1437	-.0368
SQ8	-.2817	0517	-.0253	-.0120	-.1951	-.1312
CASTA	.1655	.1061	-.0577	-.0182	-.0093	-.0925
CASTAAJ	.1688	.1534	-.0891	-.0200	.1131	-.0046
CASTB	-.0124	.0642	.1195	-.1813	-.0032	.0290
CASTBAJ	-.0143	.1455	.0761	-.1960	.2066	.1852
SCBALL	-.1001	.1676	.0735	-.2104	.0308	.0614
SCACLA	.0627	.0144	.0432	-.0588	.1583	-.2281
SCACLB	-.0944	-.0045	-.0438	.0518	-.1827	-.1991
SCACLC	-.1565	.1518	.0575	-.1804	.1465	-.1052
SCACLD	.0452	.0183	-.0942	.0821	.1196	.1485
SCACLE	.0431	.0226	.0227	-.0425	-.0052	-.0932
SCACLF	.0593	.0462	-.0670	.0382	.1764	-.0273
SCACLG	.0570	-.0586	.0089	.0353	.1276	-.0673
SCACLALL	.0145	.0474	-.0178	-.0169	.1413	-.1128

* - SIGNIF. LE .01   ** - SIGNIF. LE .001

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               SQA3       SQA4       SQA5       SQ2        SQ3        SQ4

SQA3          1.0000
SQA4          -.2551     1.0000
SQA5          -.2509      .2934     1.0000
SQ2            .4100*     .1381      .2702     1.0000
SQ3            .1948      .0824      .2024      .3637*    1.0000
SQ4            .2249     -.4600**   -.1694      .1300      .0063     1.0000
SQ5            .1991     -.0319     -.0046      .2470      .7204**    .0508
SQ6            .3245      .1680      .0825      .3470*     .7613**    .0262
SQ7            .3541*    -.1763     -.0081      .4469**    .5772**    .4478**
SQ8            .0376      .1023      .3071      .1707      .2108     -.0604
CASTA          .1166      .0219      .0571      .2131      .7872**    .0821
CASTAAJ        .0294     -.0079     -.0008     -.0010      .7260**    .0556
CASTB          .1305     -.1201      .1107      .3519*     .5319**    .1718
CASTBAJ       -.0145     -.1801      .0168      .0004      .4317**    .1347
SCBALL         .2073     -.1359     -.1653      .0381      .5310**    .0375
SCACLA         .1093     -.0741     -.0819      .1480      .2384      .1036
SCACLB        -.1101      .1323      .2105      .2432     -.0319      .0703
SCACLC         .1466     -.0738     -.2240      .1875      .2619     -.0468
SCACLD         .1846     -.3514*    -.0901      .0655      .0593      .4052*
SCACLE        -.0387     -.0893     -.0013      .2867      .0831     -.0115
SCACLF         .0917     -.2054     -.0430     -.0118      .0021      .0543
SCACLG        -.0169      .0409      .0269      .0768      .1555     -.0998
SCACLALL       .0948     -.1625     -.0619      .2048      .1722      .1093

* - SIGNIF. LE .01       ** - SIGNIF. LE .001
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              SQ5         SQ6         SQ7         SQ8         CASTA       CASTAAJ

SQ5         1.0000
SQ6          .8561**    1.0000
SQ7          .7420**     .7008**    1.0000
SQ8          .3422*      .3241       .2609      1.0000
CASTA        .6122**     .6201**     .4387**     .3763*     1.0000
CASTAAJ      .5725**     .5586**     .3510*      .3477*      .9768**    1.0000
CASTB        .4889**     .4729**     .4581**     .2777       .5862**     .5228**
CASTBAJ      .4296**     .3749*      .3173       .2326       .5462**     .5589**
SCHALL       .7270**     .6769**     .5173**     .0886       .4846**     .4876**
SCACLA       .0391       .0005       .0458      -.1745       .3066       .2813
SCACLB      -.1457      -.1291      -.0570       .1237       .0780       .0265
SCACLC       .1123       .0220       .1062       .0628       .3274*      .2940
SCACLD       .1023      -.0102       .2266       .2045       .2741       .2662
SCACLE      -.0314      -.1165       .0088      -.1713      -.0355      -.0979
SCACLF      -.0446      -.1287      -.1244       .0575       .1295       .1352
SCACLG       .2321       .0936       .0569       .1805       .2681       .2576
SCACLALL     .0652      -.0593       .0580       .0565       .3001       .2623

* - SIGNIF. LE .01      ** - SIGNIF. LE .001
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             CASTB      CASTBAJ    SCRALL     SCACLA     SCACLB     SCACLC

CASTB        1.0000
CASTBAJ       .9362**    1.0000
SCRALL        .4683**     .4859**   1.0000
SCACLA        .3115       .2772      .2735     1.0000
SCACLB       -.0167     -.1092     -.1239      .1592     1.0000
SCACLC        .3321*      .2844      .2351      .5251**    .1671     1.0000
SCACLD        .1971       .1860      .0389      .2527      .1064      .3872*
SCACLE        .0934     -.0056     -.1009      .4010*     .2036      .4315**
SCACLF        .1149       .1272     -.0004      .3204      .3128      .3708*
SCACLG        .1007       .0788      .1050      .4560**    .2276      .4470**
SCACLALL      .2596       .2005      .1009      .6984**    .4315**    .7477**

* - SIGNIF. LE .01       ** - SIGNIF. LE .001
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              SCACLD      SCACLE      SCACLF      SCACLG      SCACLALL

SCACLD        1.0000
SCACLE         .2120      1.0000
SCACLF         .2467       .1417      1.0000
SCACLG         .3081       .3144       .5178**    1.0000
SCACLALL       .5737**     .6025**     .6742**     .7347**    1.0000

* - SIGNIF. LE .01        ** - SIGNIF. LE .001
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BIBLIOGRAPHY

Anderson, C.W., and Barufaldi, J.P. (1980). Research on elementary school science teaching: A study using short term outcome measures (Occasional Paper No. 37) East Lansing, Michigan: Institute for Research on Teaching, Michigan State University.

Anderson, L.M., Evertson, C.M., and Brophy, J.E. (1979). An experimental study of effective teaching in first grade reading groups. The Elementary School Journal, 79(2): 193-223.

Anderson, L.M., Evertson, C.M., and Emmer, E.T. (1980). Dimensions in classroom management derived from recent research. Journal of Curriculum Studies, 12(4): 343-356.

Anderson, R.D. (1983). Are yesterday's goals adequate for tomorrow? Science Education, 67(2): 171-176.

Beasley, W. (1983). Teacher management behaviors and pupil task involvement during small group laboratory activities. Journal of Research in Science Teaching, 20(8), 713-719.

Bird, R.C. (1970). An investigation of teacher dogmatism and teacher behavior in science instruction (Doctoral Dissertation, Florida State University, 1970. Dissertation Abstracts International, 32(1) 266A.

Blankenship, J.W. (1964). An analysis of certain characteristics of biology teachers in relation to their reactions to the BSCS biology program (Doctoral Dissertation, The University of Texas, 1964). Dissertation Abstracts International, 25(5) 2800A.

Brewington, W.C. (1971). A study of first year secondary school teachers who completed preservice programs at the Ohio State University. (Doctoral Dissertation, The Ohio State University, Columbus, Ohio, 1971). Disseration Abstracts International, 32, 3550A.

Brown, W.R. (1972). Teacher competencies and characteristics in science preservice teacher education project. (Doctoral Dissertation, The Ohio State University, Columbus, Ohio, 1972). Dissertation Abstracts International, 33, 6430A.

Campbell, J.R. (1977). Science teachers' flexibility. Journal of Research in Science Teaching, 14(6), 525-532.

Chester, D.W., McDaniel, T.R., and Cheser, D.B. (1982). The effect of a classoom management course on teacher's disciplinary styles. High School Journal, 66(1): 1-6.

Cignetti, J.A. (1971). A comparative study of the perceptions of beginning science teachers in relationship to their science classroom activities, cultural attitudes and knowledge of culturally deprived students. (Doctoral Dissertation, The Ohio State University, Columbus, Ohio, 1971). Disseration Abstracts International, 32, 5997A.

Coleman, W.T. and Selby, C.C., co-chair. NSB Commission on Precollege Education in Mathematics, Science, and Technology. (1983). Educating Americans for the 21st century. Washington, D.C.: National Science Foundation, September.

Darrow. L.L. (1972). An analysis of certain selected characteristics of teachers who are teaching non-innovative and selected innovative science curricula (Doctoral Dissertation, The University of Nebraska, 1972). Dissertation Abstracts International, 33 (7), 3148A.

Emmer, E.T. (1981). Effective classroom management in junior high classrooms (Research and Development Report No. 6111). Austin: Research and Development Center for Teacher Education, The University of Texas at Austin.

Emmer, E.T., Evertson, E.M., and Anderson, L.M. (1980). Effective management at the beginning of the school. The Elementary School Journal, 80(5): 219-231.

Emmer, E.T., Sanford, J.P., Clements, B.S., and Martin, J. (1982). Improving classroom management and organization in junior high schools: An experimental investigation (Research and Development Report No. 6153). Austin: Research and Development Center for Teacher Education, The University of Texas at Austin.

Estep, L.E., Willower, D.J., and Licata, J.W. (1981). Teacher pupil control ideology and behavior as predictors of classroom robustness. The High School Journal, 63(4): 342-347.

Evertson, C.M. (1982). Differences in instructional activities in higher-and lower-achieving junior high English and math classes. The Elementary School Journal, 82(4), 329-350.

Evertson, C.M., and Emmer, E.T. (1982). Effective management at the beginning of the school year in junior high classes. Journal of Psychology, 74(4):485-498.

Evertson, C.M., Emmer, E.T., and Brophy, J.E. (1980). Predictors of effective teaching in junior high school mathematics classrooms. *Journal of Mathematics Education, 11*(3), 167-178.

Evertson, C.M., Emmer, E.T., and Clements, B.S. (1980). *Report of the methodology, rationale, and instrumentation of the junior high classroom organization study* (Research and Development Report No. 6100). Austin: Research and Development Center for Teacher Education, The University of Texas at Austin.

Evertson, C.M., Emmer, E.T., Sanford, J.P., and Clements, B.S. (1982) Improving classroom management: An experiment in elementary school classrooms. *The Elementary School Journal, 84*(2): 173-188.

Fisher, C., Berlinger, D., Filby, M., Marliave, R., Cahan, L., and Dishaw, M. (1980). Teaching behaviors, academic learning time, and student achievement: An overview. In C. Denham and A. Lieberman (Eds.), *Time to learn*. Washington, D.C.: National Institute of Education.

Fisher, D.L., and Fraser, B.J. (1983). A comparsion of actual and preferred classroom environments as perceived by science teachers and students. *Journal of Research in Science Teaching, 20*(1), 55-61.

Galligan, B.J. (1982) *The relationship of principal's leadership priorities and teacher's classroom management skills* (Research and Development Report No. 6152). Austin, Texas: Research and Development Center for Teacher Education, The University of Texas at Austin.

Good, T.L. (1983, February). *Recent classroom research: Implications for teacher education.* Paper presented at the annual meeting of the American Association of Colleges of Teacher Education, Chicago, Illinois.

Halpin, G., Halpin, G., and Harris, K. (1982). Personality characteristics and self-concept of preservice teachers related to their pupil control orientation. *Journal of Experimental Education, 50*(4): 195-199.

Harty, H. and Hassan, H.A. (1983). Student control ideology and the science classroom environment in urban secondary schools in Sudan. *Journal of Research in Science Teaching, 20*(9), 851-859.

Iddings, R., Chairman, Ohio Teacher Education and Certification Advisory Commission. (1985). *Proposed standards for teacher education and certification.* Columbus, Ohio: Ohio Department of Education.

James, K.C. (1978). Teacher perceptions of factors in the school environment which influence innovative science teaching (Doctoral Dissertation, Columbia University Teachers College, 1978). Dissertation Abstracts International, 39(6), 3495A.

Jones, D.R. (1982). The influence of length and level of student teaching on pupil control ideology. High School Journal, 65(7): 220-225.

Jones, D.R., and Harty, H. (1978). Instructional and classroom management preferences of secondary school science teachers. Science Education, 62(1), 1-9.

Jones, D.R., and Harty, H. (1981). Classroom management-pupil control ideologies before and after secondary school science student teaching. Science Education, 65(1), 3-10.

Kochendorfer, L.H. (1966). A comparative study of the classroom practices and teaching rationale of high school biology teachers using different curriculum materials. Dissertation Abstracts, 27(9): 2947-A.

Kounin, J.S. (1970). Discipline and group management in classrooms. New York: Holt, Rinehart, and Winston.

Lazarowitz, R., Barufaldi, F.J., and Huntsberger, P.J. (1978). Student teachers' characteristics and favorable attitudes toward inquiry. Journal of Research in Science Teaching. 15(6): 559-566.

Leeds, C.H. and Cook W.W., (1947) The construction and differential value of a scale for determining teacher pupil attitudes. Journal of Experimental Education. 16: 149-159.

Lewis, R. and Lovegrove, M. (1984). Teachers' classroom control procedures: Are students' preferences being met? Journal of Education for Teaching, 10: 97-105.

Lovegrove, M. and Lewis R. (1982). Classroom-control procedures used by relationship-centered teachers. The British Journal of Education, 8(1) 55-666.

Lunenburg, F.C., and O'Reilly, R.R. (1974). Personal and organizational influence on pupil control ideology. The Journal of Experimental Education, 42: 31-35.

McGarity J.R., and Butts, D.P. (1984). The relationship among teacher classroom management behavior, student engagement, and student achievement of middle school and high school science students of varying aptitude. Journal of Research in Science Teaching, 21(1), 55-61.

Moore, R.L. (1982). Elementary teachers' attitudes toward student-centered science as related to teacher concerns (Doctoral Dissertation, University of Southern Mississippi, 1982). Dissertation Abstracts International, 43, 1916A.

Moser, C.J. (1982). Changing attitudes of student teachers on classroom discipline. Teacher Educator, 18(1): 10-15.

National Science Teachers' Association, (1982). Science-technology-society: Science education for the 1980's. Washington, D.C.: National Science Teachers' Association.

Norusis, M.J. (1985). SPSS, advanced statistics guide. New York: McGraw-Hill Publishing.

Pugh, J.B. (1965). Performance of teachers and pupils in small classes. New York: Institute of Administrative research. Teachers College, Columbia University.

Rose, K.R. and Willower, D.L. (1981). Teacher's sense of power and the consistency of their pupil control ideology and behavior. Education, 101(4) 84-88.

Sagness, R.L. (1970). A study of selected outcomes of a science pre-service teacher education project emphasizing early involvement in schools of contrasting environmental settings. (Doctoral Dissertation, The Ohio State University, Columbus, Ohio, 1970). Dissertation Abstracts International, 31, 4606A.

Sanford, J.P. (1977). Class academic aptitude level as a factor affecting the use of inquiry strategies in high school biology classes (Doctoral Dissertation, The University of Texas at Austin). Dissertation Abstracts International, 38(7), 4076A.

Sanford, J.P. (1984). Management and organization in science classrooms. Journal of Research in Science Teaching, 21(6) 575-587.

Sanford, J.P. (1984). Science classroom management and organization. In Charles W. Anderson (Ed.), Observing science classrooms: Observing science perspectives from research and practice. 1984 Yearbook of the Association for the Education of Teachers in Science. Columbus, Ohio: ERIC Clearinghouse.

Sanford, J.P., and Evertson, C.M. (1981). Classroom management in a low SES junior high: Three case studies. Journal of Teacher Education, 32(1), 34-38.

Sanford, J.R., and Evertson, C.M. (1983). Time use and activities in junior high classes. Journal of Educational Research, 76(3), 140-147.

Scannel, D., chairman, (1982). Task force report on extended programs. American Association for College of Teacher Education.

Shay, E.L. (1974). A study of relationships among selected teacher variables and expressed preferences for student-centered, non-direct science education (Doctoral Dissertation, The Ohio State University, 1974). Dissertation Abstracts International, 35(5), 2795A.

Smith, D.K. (April, 1981). Classroom management styles and personality variables of teachers and education majors: Similarities and differences. Paper presented at the Annual Meeting of the American Educational Research Association, Los Angeles, California.

SPSSx, Inc. (1986). SPSSx user's guide (2nd Ed.). New York: McGraw-Hill Publishing.

Stake, R.E. and Easley, J.A. (1978). Case studies in science education. Urbana, Illinois: Center for Instructional Research and Curriculum Evaluation, University of Illinois.

Swami, P. (1975). A follow-up study for evaluation of the preservice secondary science teacher education program at The Ohio State University. (Doctoral Dissertation, The Ohio State University, Columbus, Ohio, 1975). Disseration Abstracts International, 36, 7360A.

Tobin, K. (1984). Student task involvement in activity oriented science. Journal of Research in Science Teaching, 21(5), 469-482.

Whittsitt, R.C. (1955). Comparing the individualities of large secondary school classes with small secondary school classes through the use of a structured observation schedule (Doctoral Dissertation, 1955). Dissertation Abstracts International, X-103.

Williamson, S.E. (1956). Personal problems of teachers influencing classroom teacher-pupil relationships. Unpublished Doctoral Dissertation, University of Oregon, Eugene, Oregon.

Willower, D.J., Eidell, T.L., and Hoy, W.K. (1967). The school and pupil control ideology. (The Pennsylvania State University Studies, Number 24). University Park: The Pennsylvania State University.

Winer, B.J. (1971). Statistical Principals in Experimental Design (2nd ed.). New York: McGraw-Hill Publishing.

Yeany, R. (1976). A study of the correlation between elementary student teachers' selection of science teaching strategies and average class ability and size. Journal of Research in Science Teaching, 13(2), 249-252.